Forelimb and Hindlimb Musculature of the Crab-Eating Macaque (*Macaca fascicularis*)

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Notes on the Specimen

We dissected a junvile male Mauritius crab-eating macaque (*Macaca fascicularis*) obtained from a biomedical research laboratory at The Ohio State University. The specimen was roughly 3.5 years of age at time of death and weighed approximately 4kg. Due to the nature of biomedical research, the specimen's brain, spinal cord, and viscera had been removed prior to our dissection. The forelimbs were also removed via disarticulartion of the acromioclaviuclar joint prior to our study (figure 1). Given these conditions, we focused our dissection on the intact forelimb and hindlimb musculature. Clinically Oriented Anatomy (Moore 2014) was used as a reference for human anatomical comparisons.

Figure 1: Juvenile male *Macaca fascicularis* prior to dissection.

Superficial Dissection of Forelimb

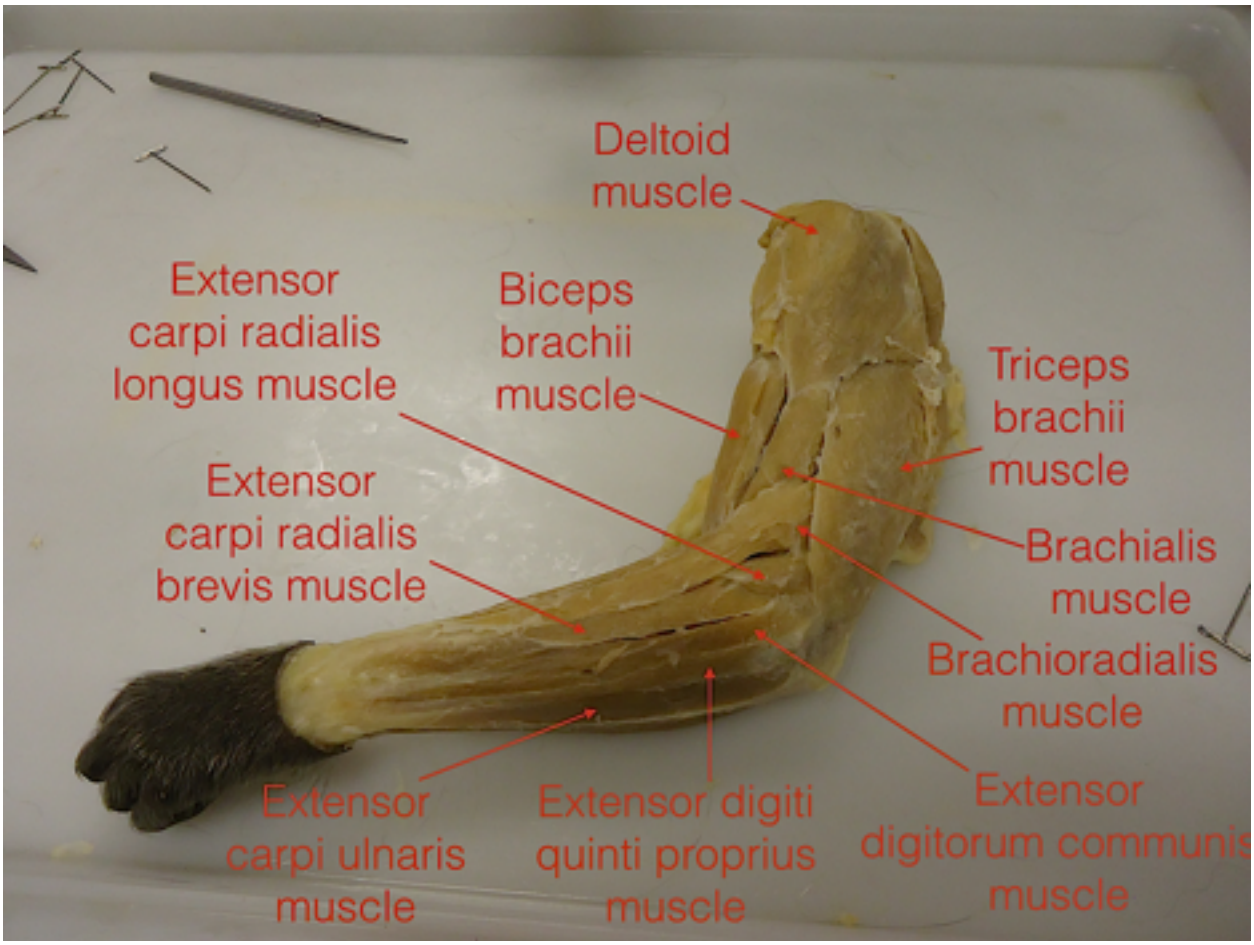

Figure 2: Superficial dissection of upper limb (left; lateral view)

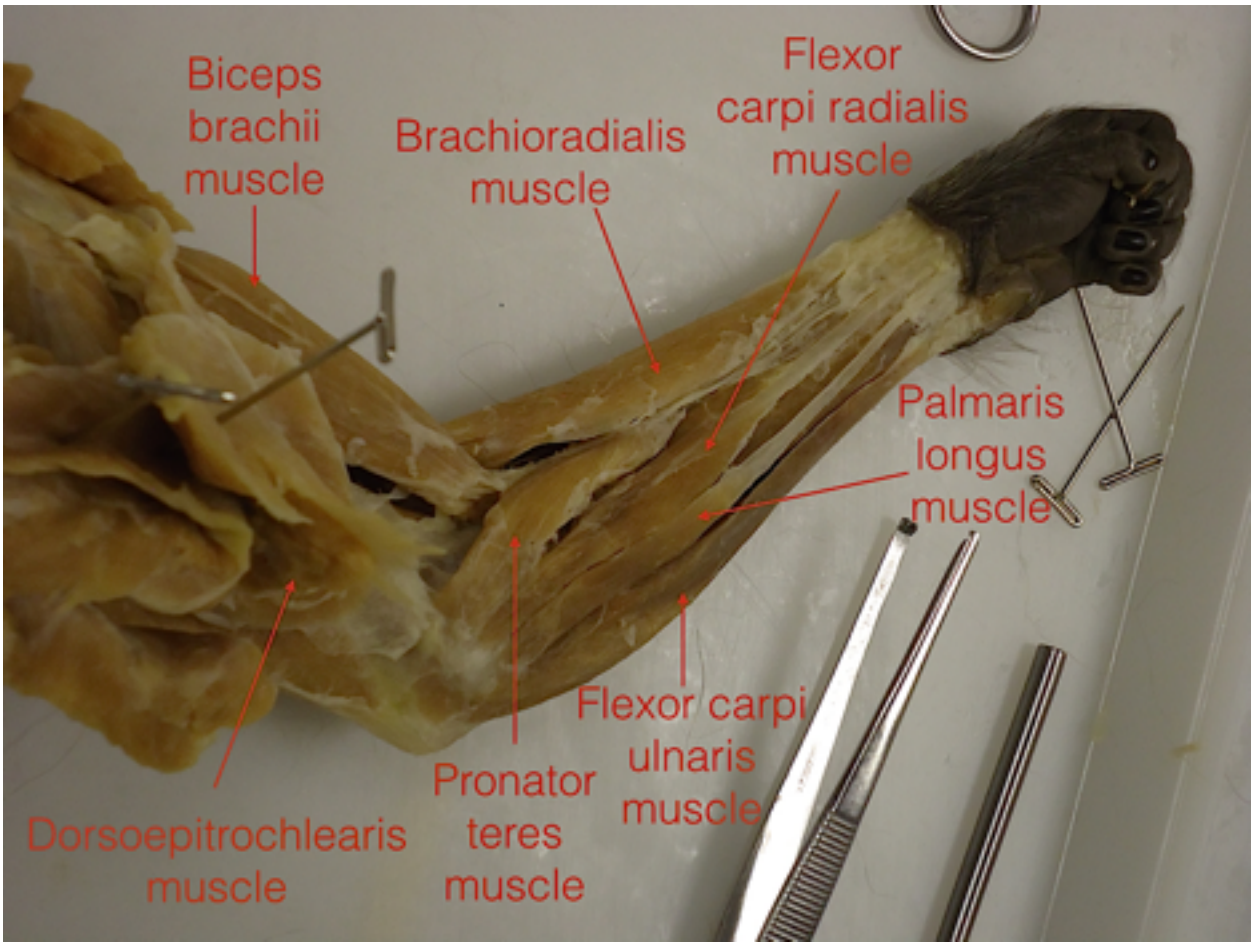

Figure 3: Superficial dissection of upper limb (left; medial view)

Muscles of the Shoulder

Trapezius

The trapezius is a large muscle with origins on the inferior portion of the occipital bone and the spinous processes of various vertebrae (human: C7-T12; *M. mulatta*: variable cervical vertebrae insertion-T10) (Howell and Straus, 1933). Trapezius inserts on the superior aspect of the scapular spine, acromion, and acromial extremity of the scapula. Due to the nature of our *M. fascicularis* specimen prior to dissection, only the lateral aspect of the muscle and its insertions are present (Figure 4).

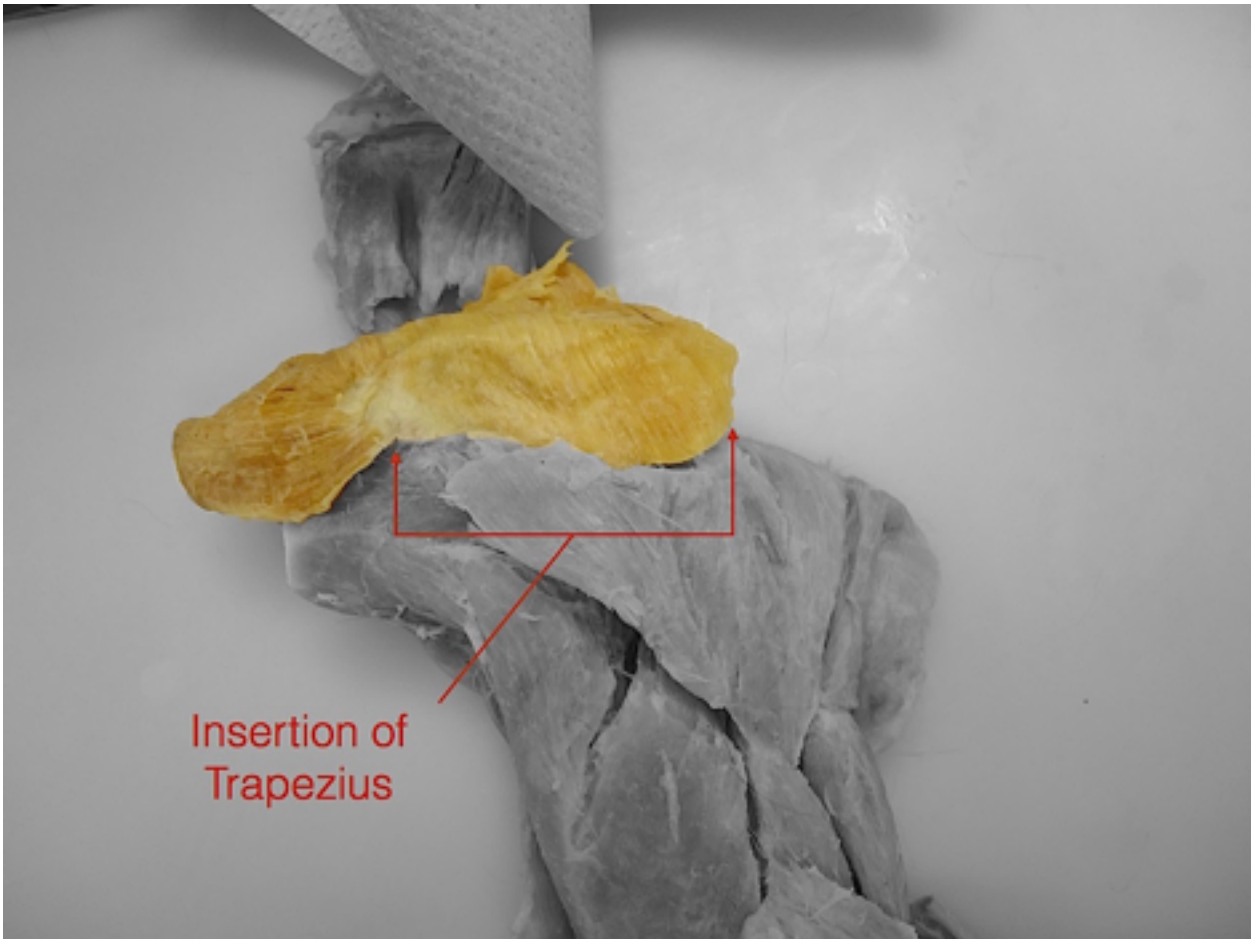

Figure 4: Trapezius m. (right; lateral view)

Deltoid

This muscle originates from three areas: lateral portion of the clavicle, acromion, and scapular spine and inserts on the deltoid tuberosity of the humerus (Figure 5). The distinctions among the three aforementioned muscle origins and fiber orientations are readily apparent in both *Macaca mulatta* and *Macaca fascicularis* but less so in humans.

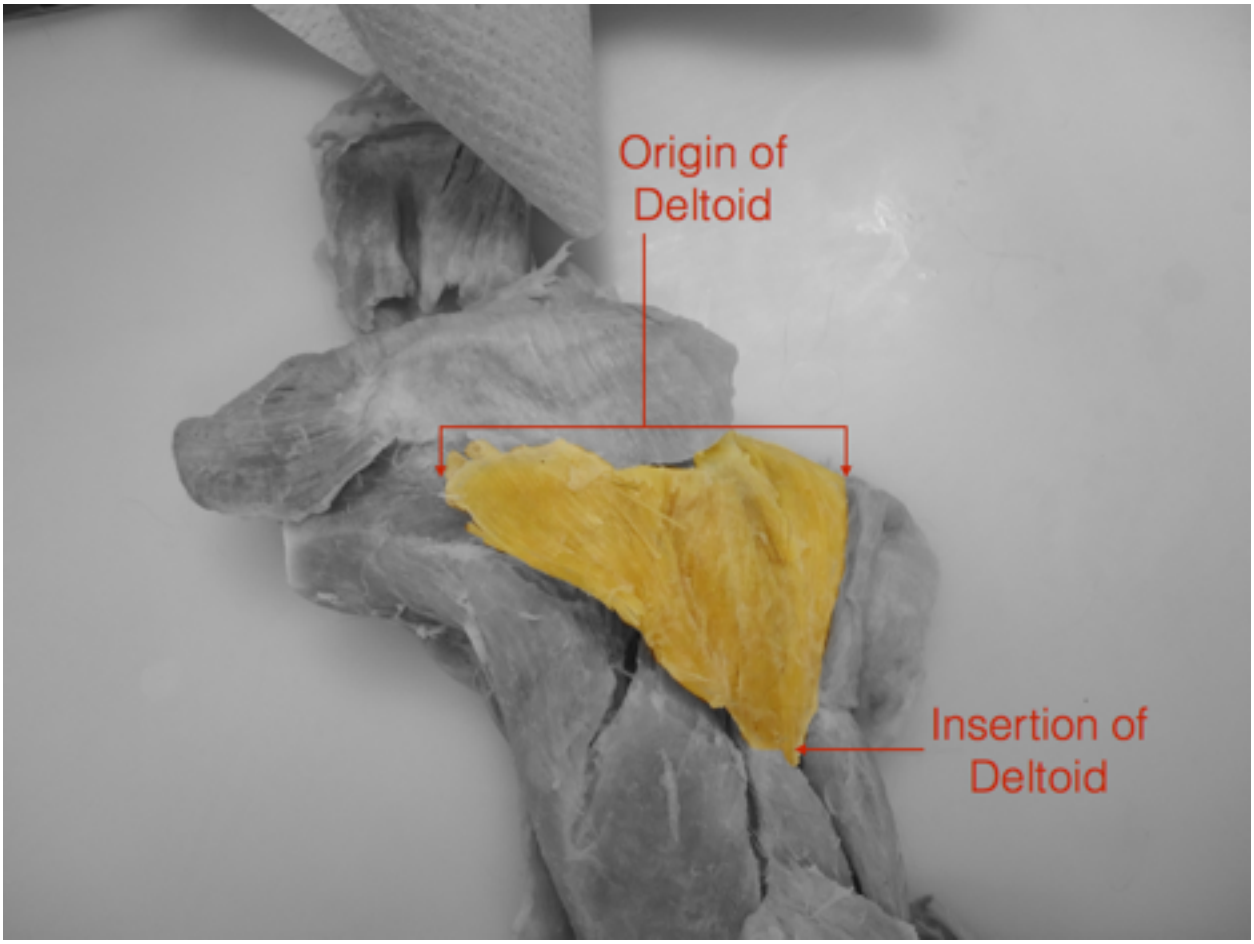

Figure 5: Deltoid m. (right; lateral view)

Subscapularis

Subscapularis originates from the entire medial border on the ventral surface of the scapula and attaches to the lesser tuberosity of the humerus (Figure 6; Howell and Straus, 1933). This configuration is functionally equivalent to that of humans.

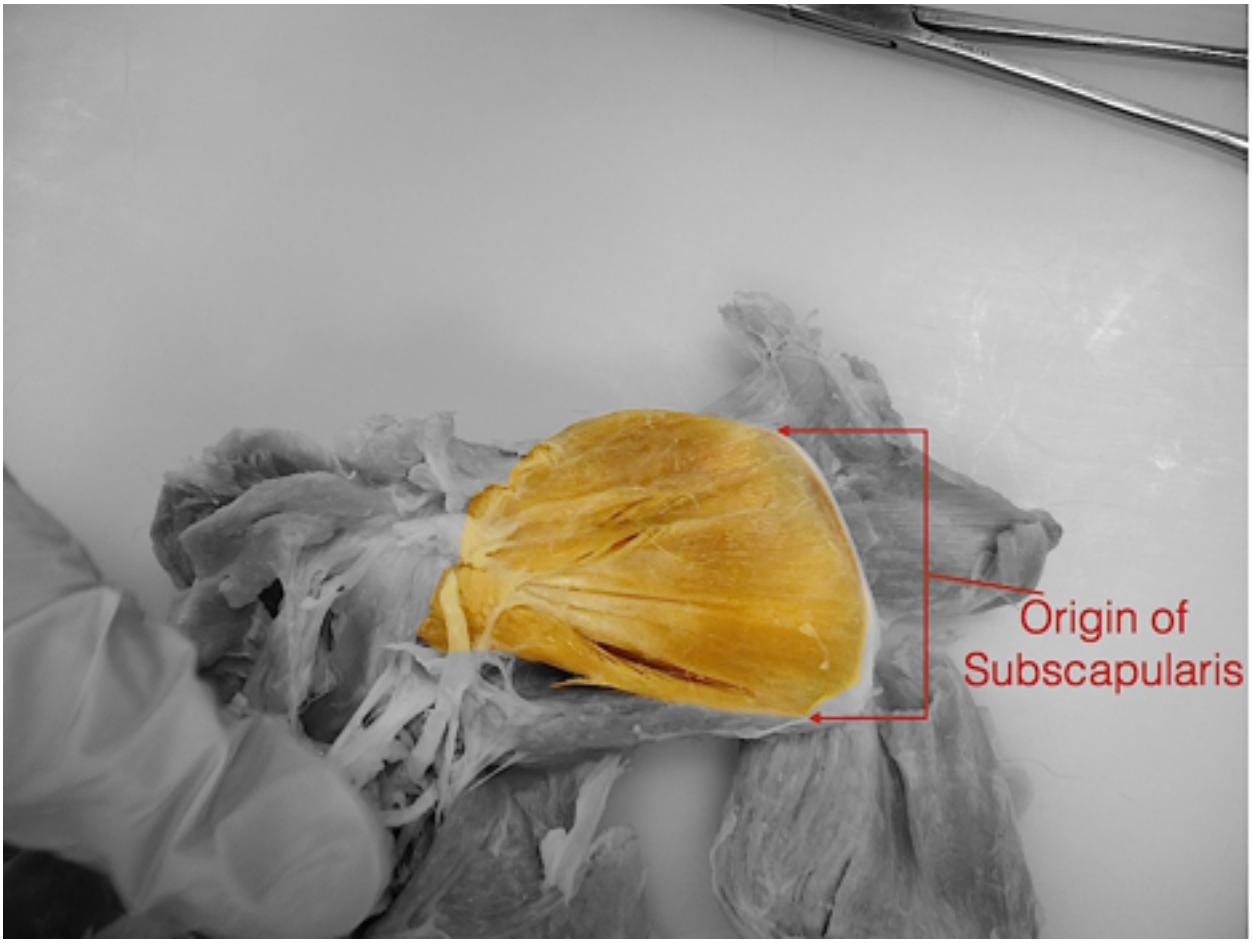

Figure 6: Subscapularis m. (right; ventral view)

Supraspinatus

In Macaca this muscle originates from the superodorsal aspect of the scapula (i.e., suprascapular fossa), attaches to the superior aspect of the greater tuberosity of the humerus, and is functionally similar to that of humans (Figure 7).

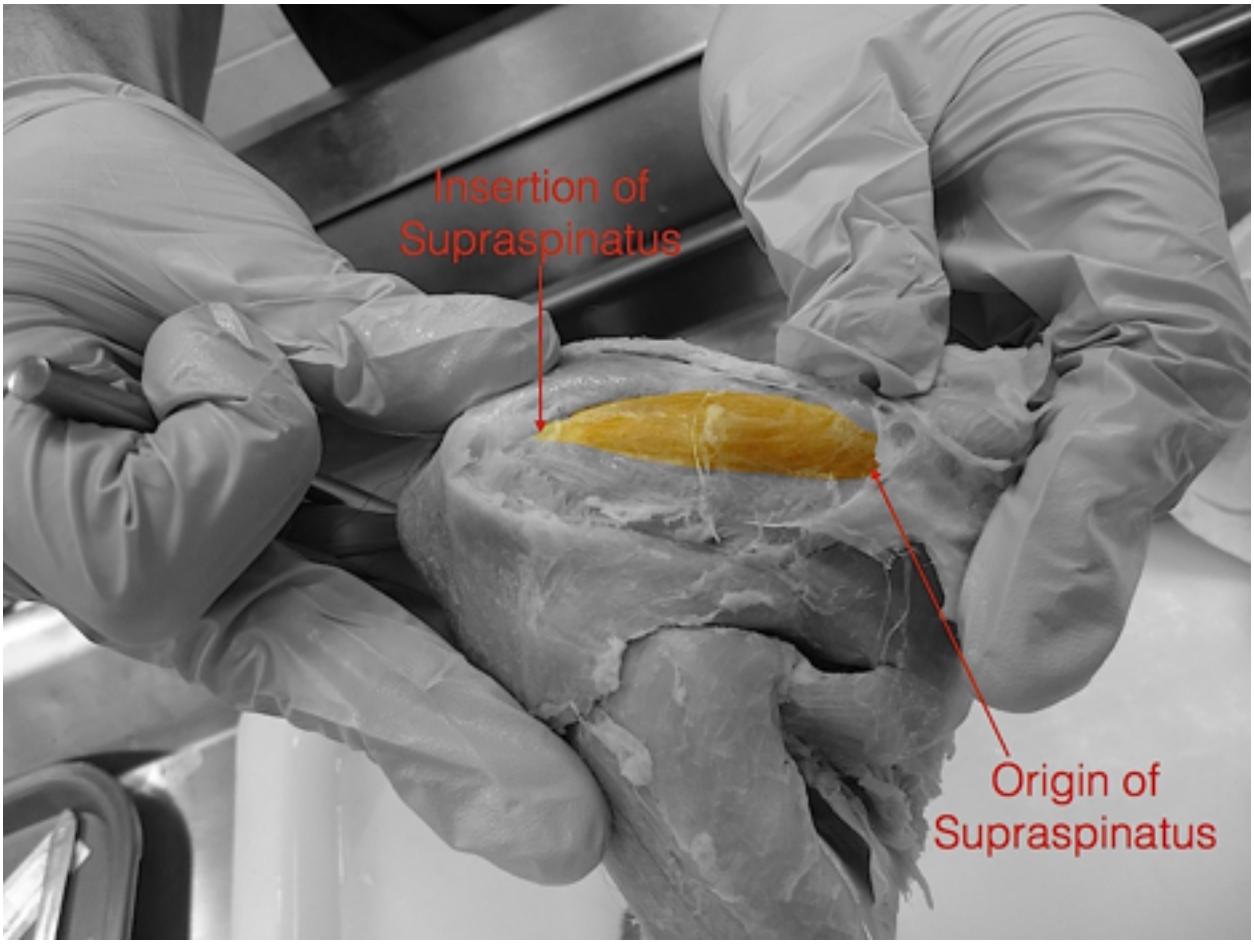

Figure 7: Supraspinatus m. (left; dorsal view; trapezius m. reflected laterally)

Infraspinatus

As in humans, the infraspinatus originates from most of the inferior two-thirds of the dorsal aspect of the scapula (i.e., infraspinous fossa) and attaches to the superoposterior aspect of the greater tuberosity of the humerus (Figure 8).

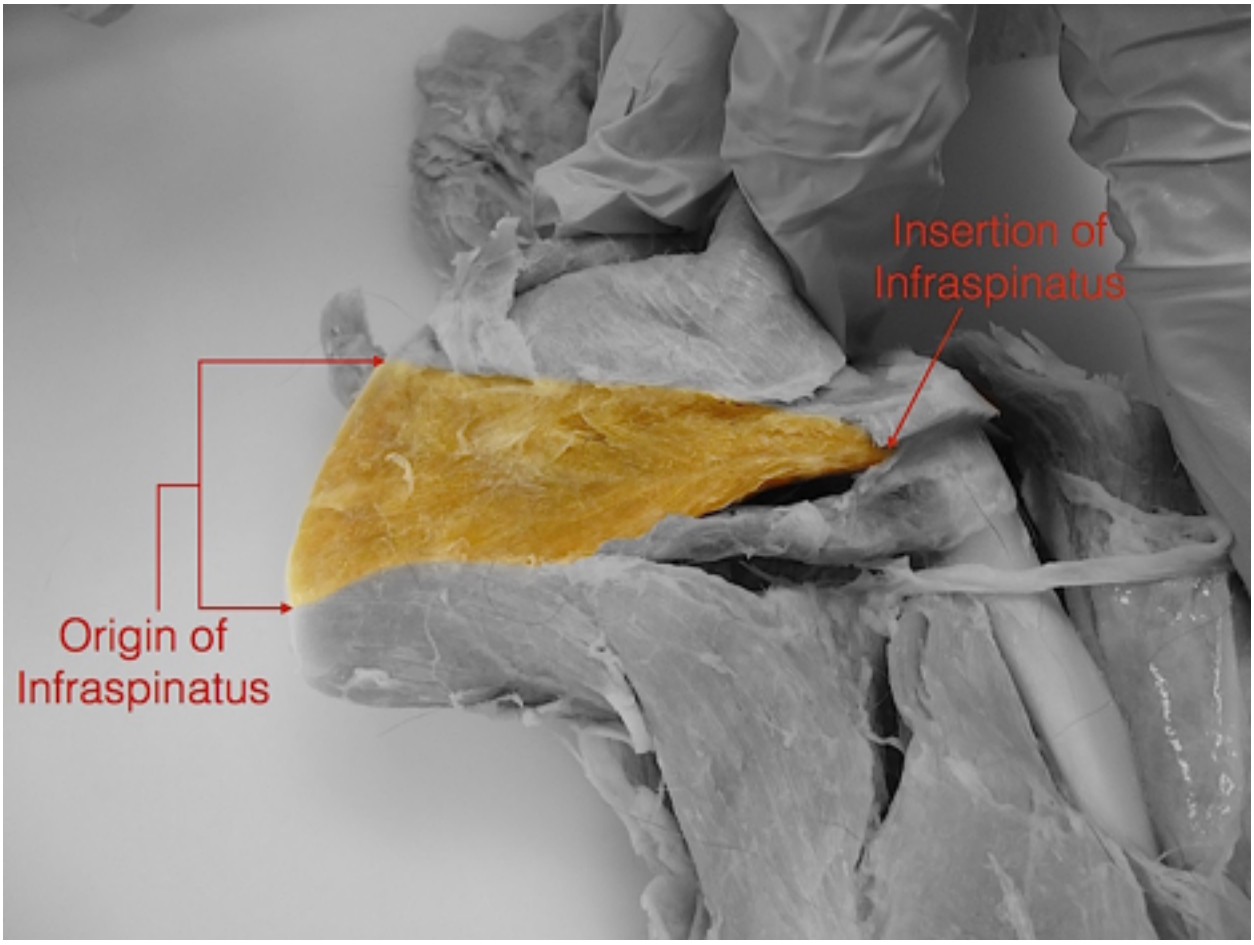

Figure 8: Infraspinatus m. (right; dorsal view)

Teres minor

In *Macaca* and humans this muscle originates from the lateral border of the scapula just superior to the attachment of the teres major m. and inserts on the inferior portion of the greater tuberosity of the humerus (Figure 9).

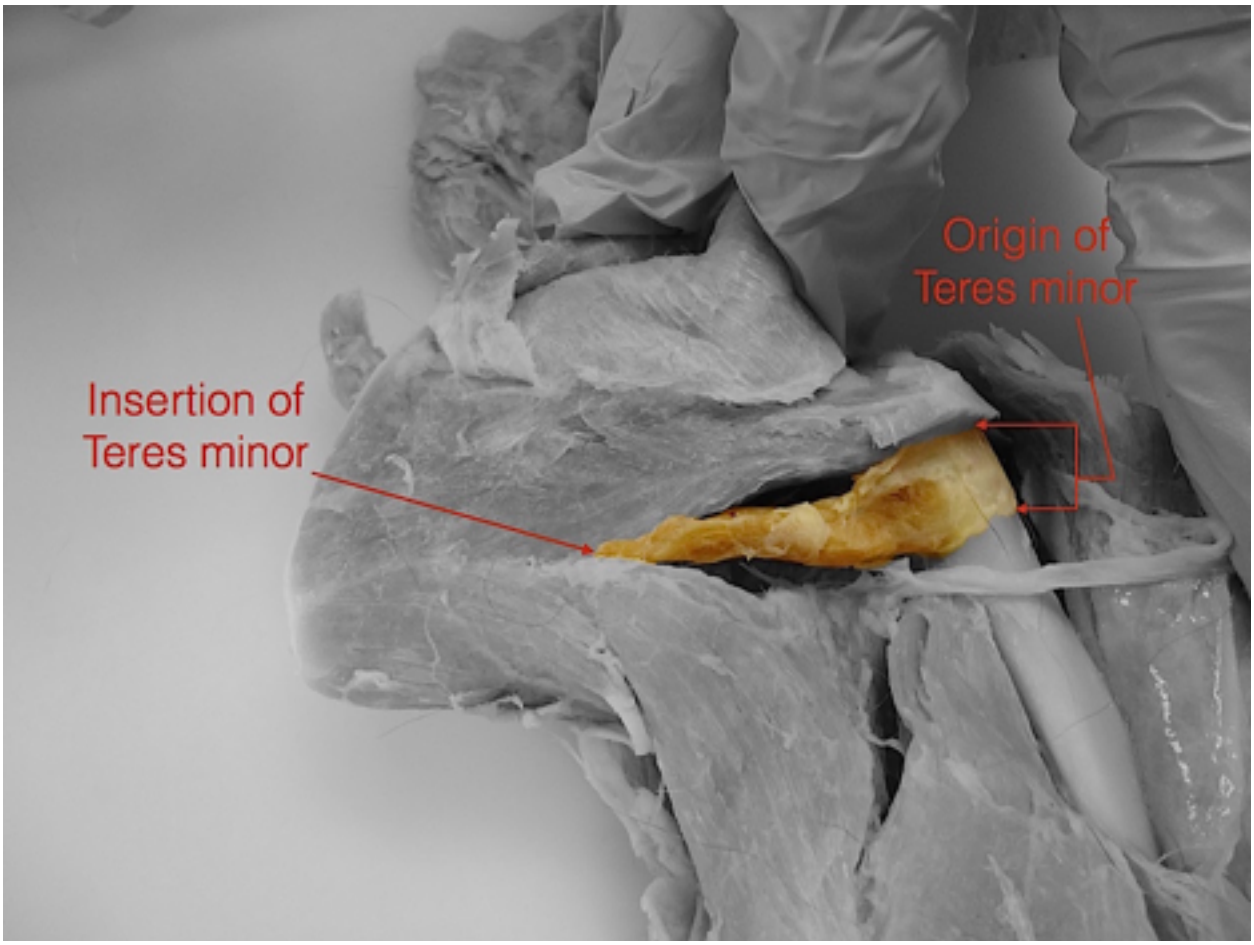

Figure 9: Teres minor (right; dorsal view)

Teres major

This muscle is functionally equivalent in *Macaca* and humans. It originates from the inferior angle and inferior portion of the lateral border of the scaupula on both dorsal and ventral aspects and attaches on the intertubercular sulcus of the humerus (Figure 10).

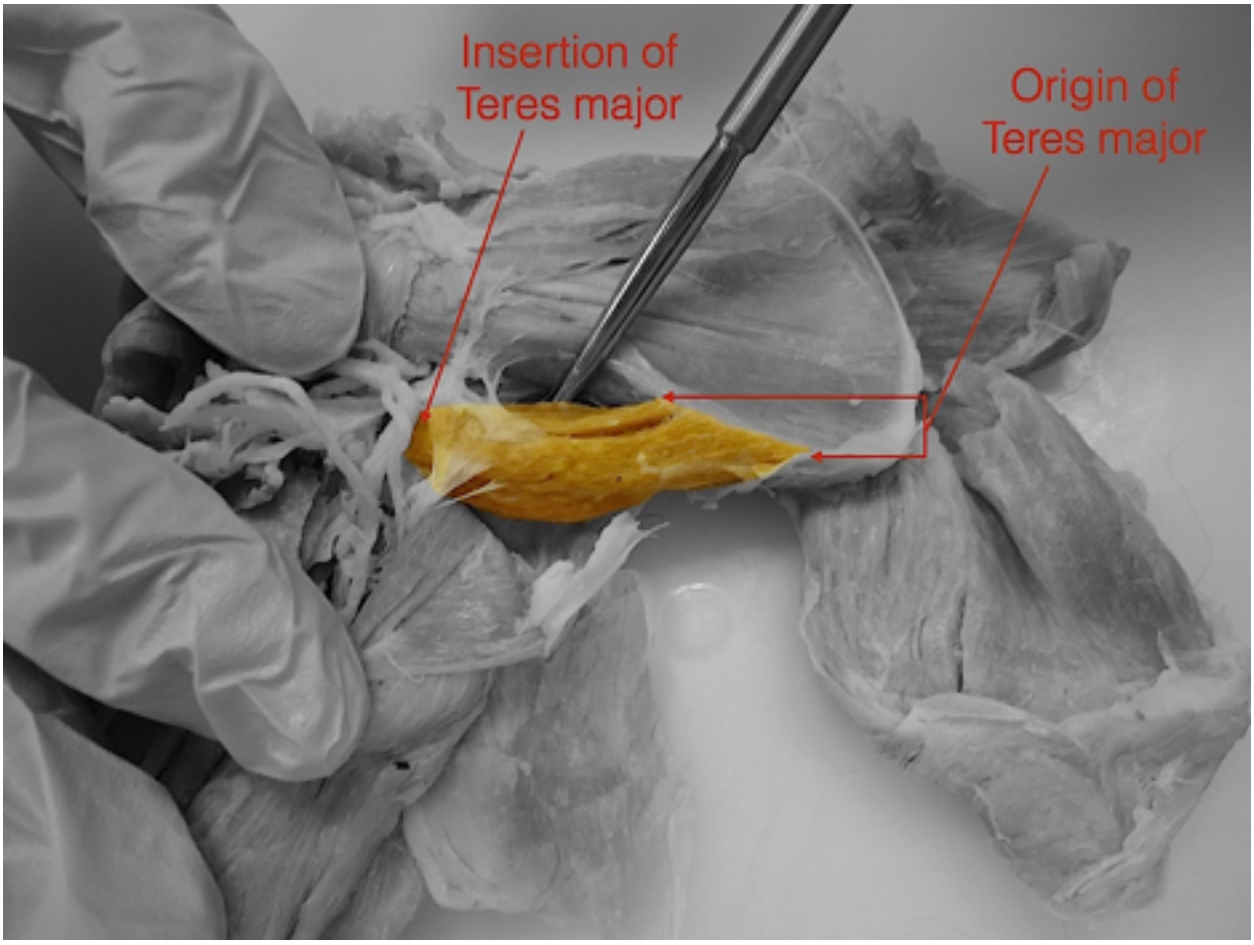

Figure 10: Teres major m. (right; ventral view)

Muscles of the Arm

I. Flexors

Biceps brachii

This muscle is composed of a short head and a long head that insert on the radial tuberosity via a common tendon (Figure 11). The long head is more lateral of the two heads and originates from the supraglenoid of the tubercle. The short head originates from the coracoid process of the scapula and appears medial to the long head. This configuration is similar in humans and macaques.

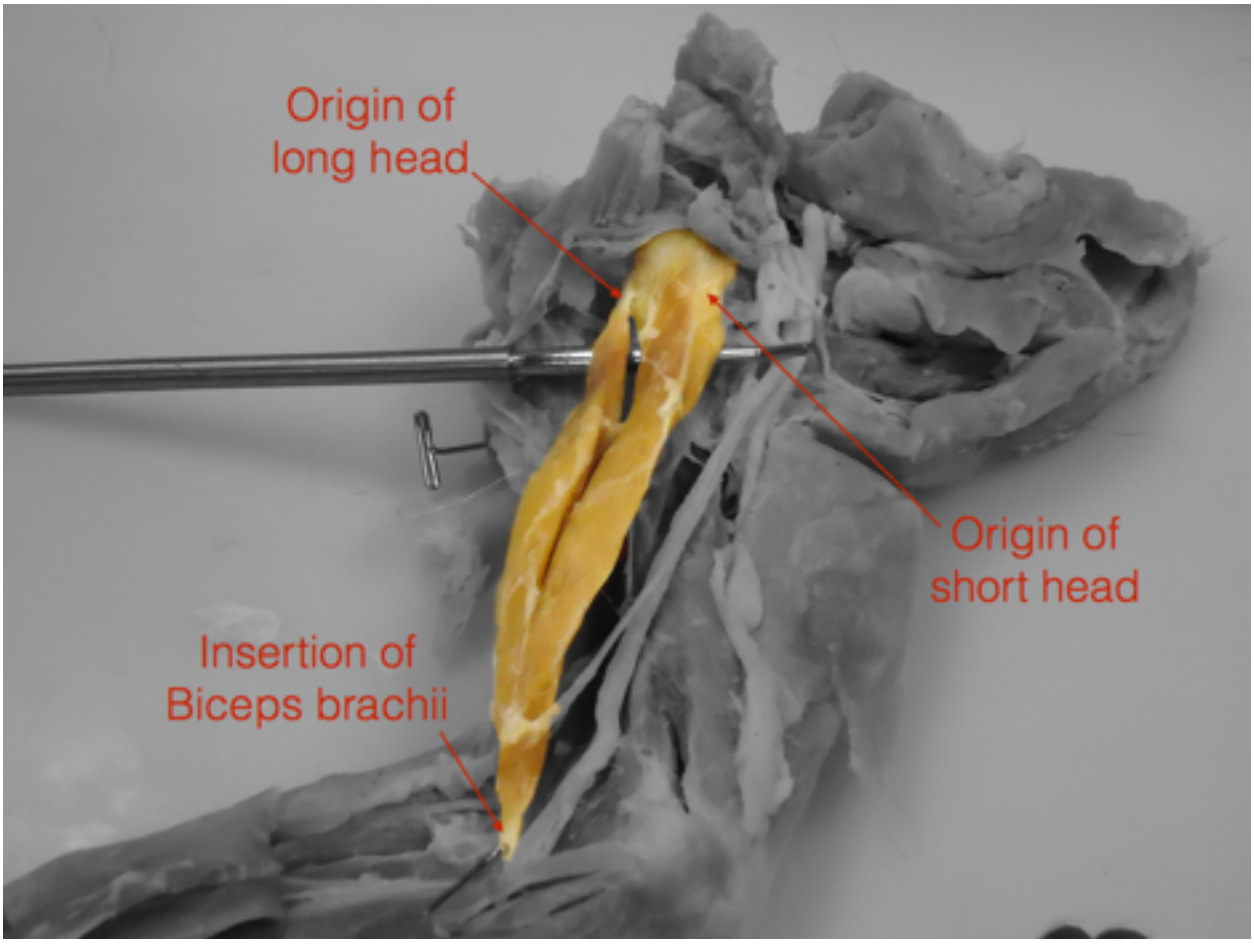

Figure 11: Biceps brachii m. (right; medial view)

Coracobrachialis

In *Macaca*, and unlike humans, this muscle is sometimes divided into two discrete parts: the coracobrachialis profundus and coracobrachialis medius (Howell and Straus, 1933; Kimura and Takai, 1970). Both of these muscles originate from the coracoid process of the scapula via a common tendon. Coracobrachialis profundus attaches to the surgical neck of the humerus while the coracobrachialis medius attaches further distally on the medial portion of the humeral midshaft. The common origin and two insertion points are visible in the figure (12); however, there was no obvious distinction between muscles bellies of coracobrachialis profundus and coracobrachialis medius in our specimen.

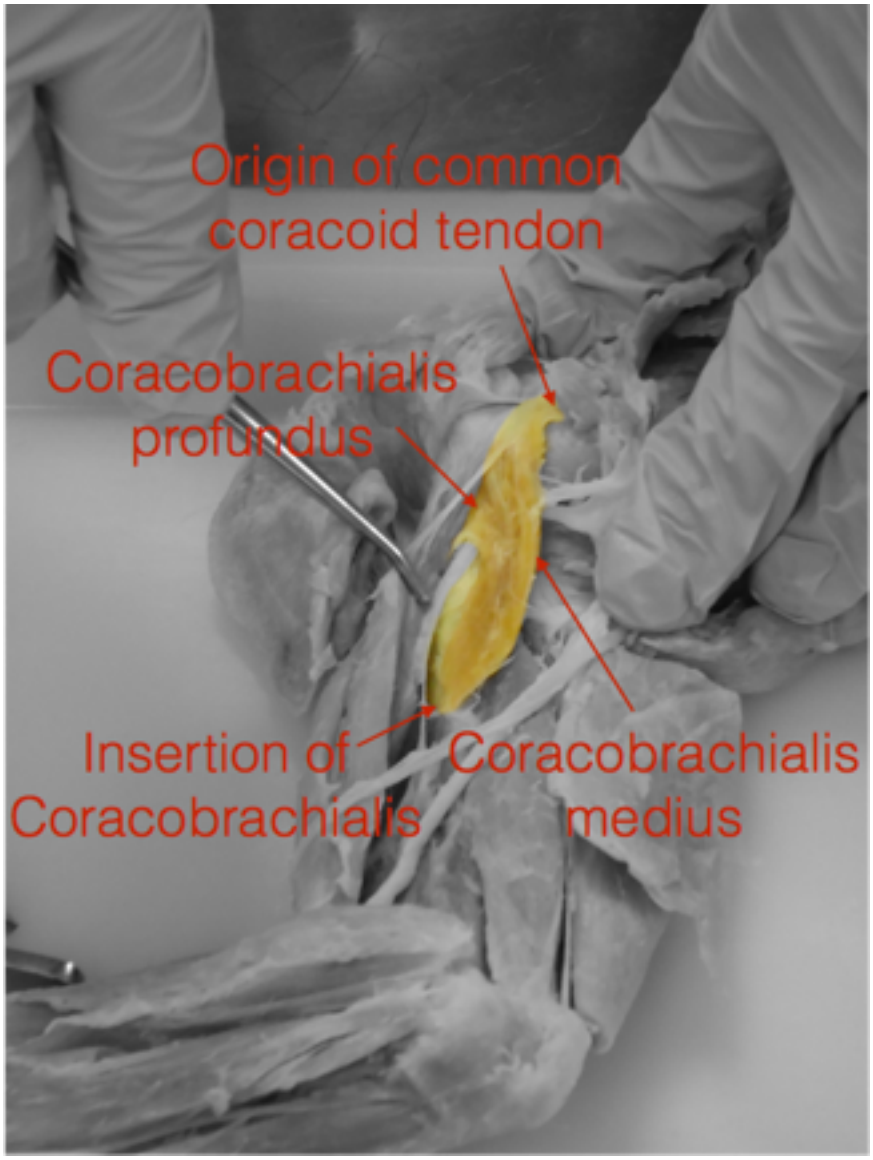

Figure 12: Coracobrachialis m. (right; medial view)

Brachialis

This muscle originates inferior to the deltoid tuberosity and spans the distal half of the humerus (Figure 13A). It attaches to the ulnar tuberosity and coronoid process of the ulna and is functionally similar to that of humans (Figure 13B).

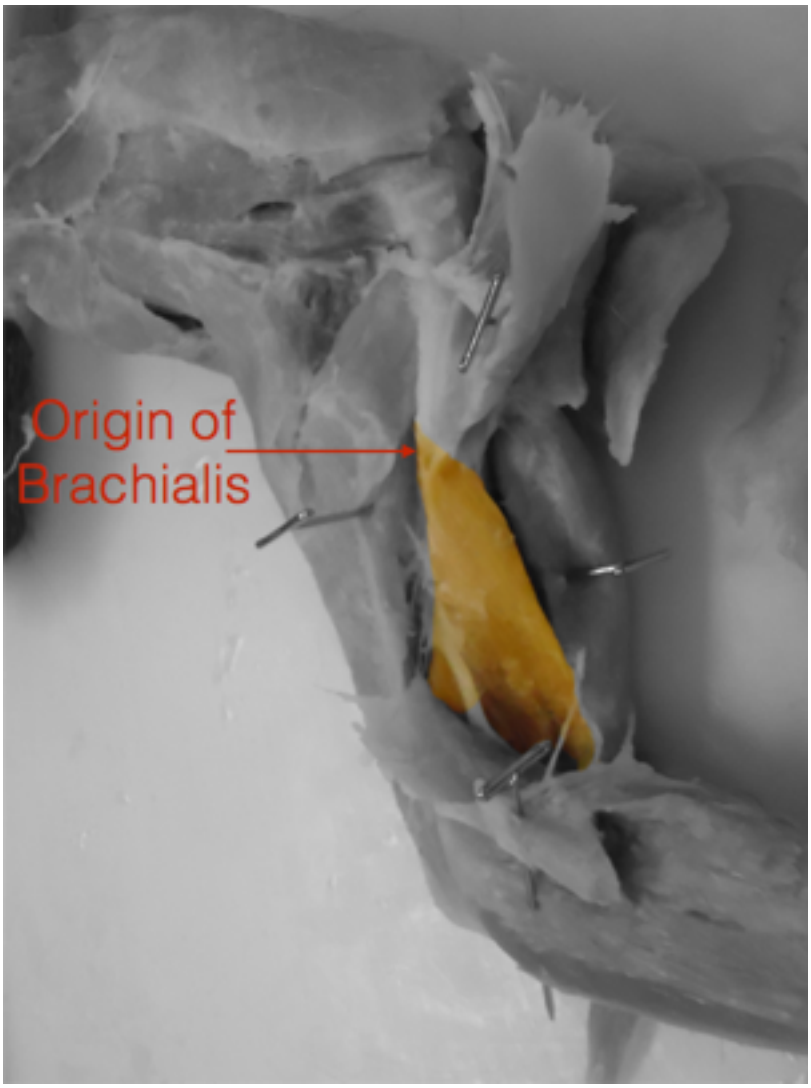

Figure 13A: Brachialis m. (left; medial view; deltoid m. reflected superio-laterally)

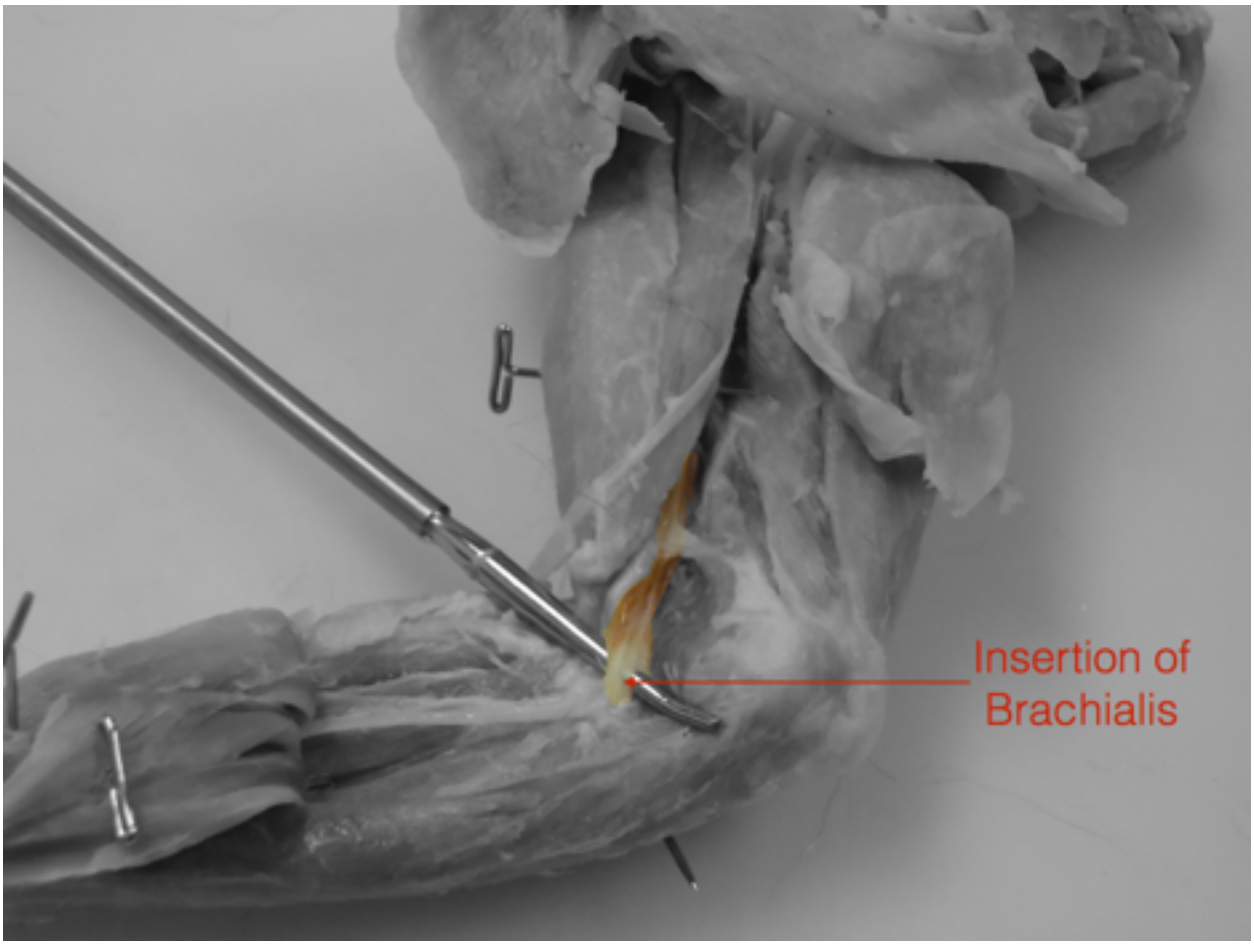

Figure 13B: Brachialis m. (right; medial view; pronator teres m., flexor carpi radials m., and palmaris longus m. reflected distally)

II. Extensors

Dorsoepitrochlearis

This muscle, rarely present in humans, cooperates with the latissimus dorsi m. to extend the forearm in *Macaca*. It originates directly from the muscles fibers of latissimus dorsi, extends inferiorly on the medial aspect of the arm, and attaches to the medial epicondyle of the humerus via a substantial aponeurosis (Figure 14).

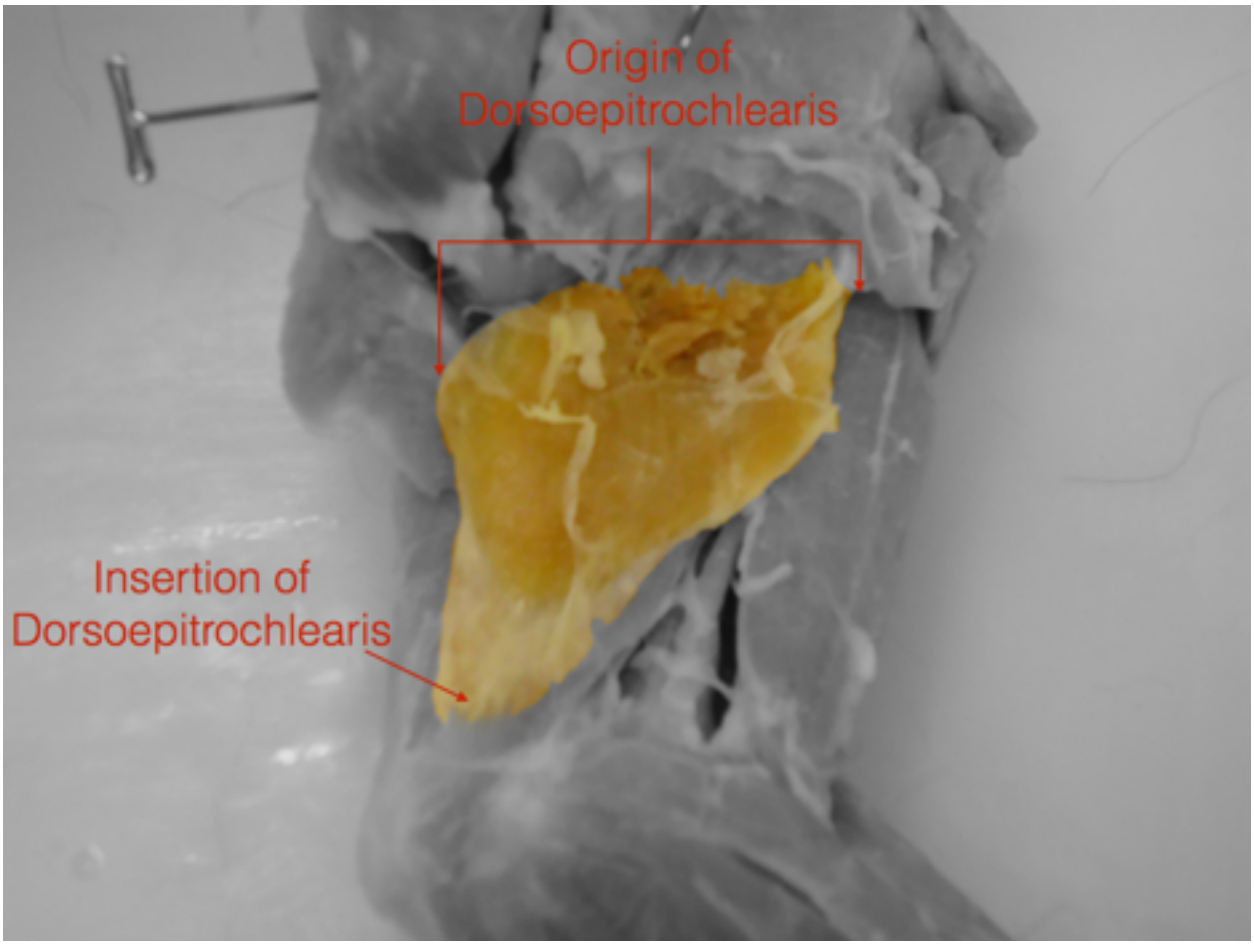

Figure 14: Dorsoepitrochlearis m. (left; medial view)

Triceps brachii

As in humans this muscle is composed of three heads: long, lateral, and medial. The long head originates from the middle portion of the axillary border of the scapula. The lateral head is proportionately much larger in *Macaca* compared to humans and originates from the posterior surface of the humeral shaft. The medial head (not pictured in figure 15) originates from the inferior half of the posterior humerus. All three heads insert via a common tendon to the olecranon process of the ulna.

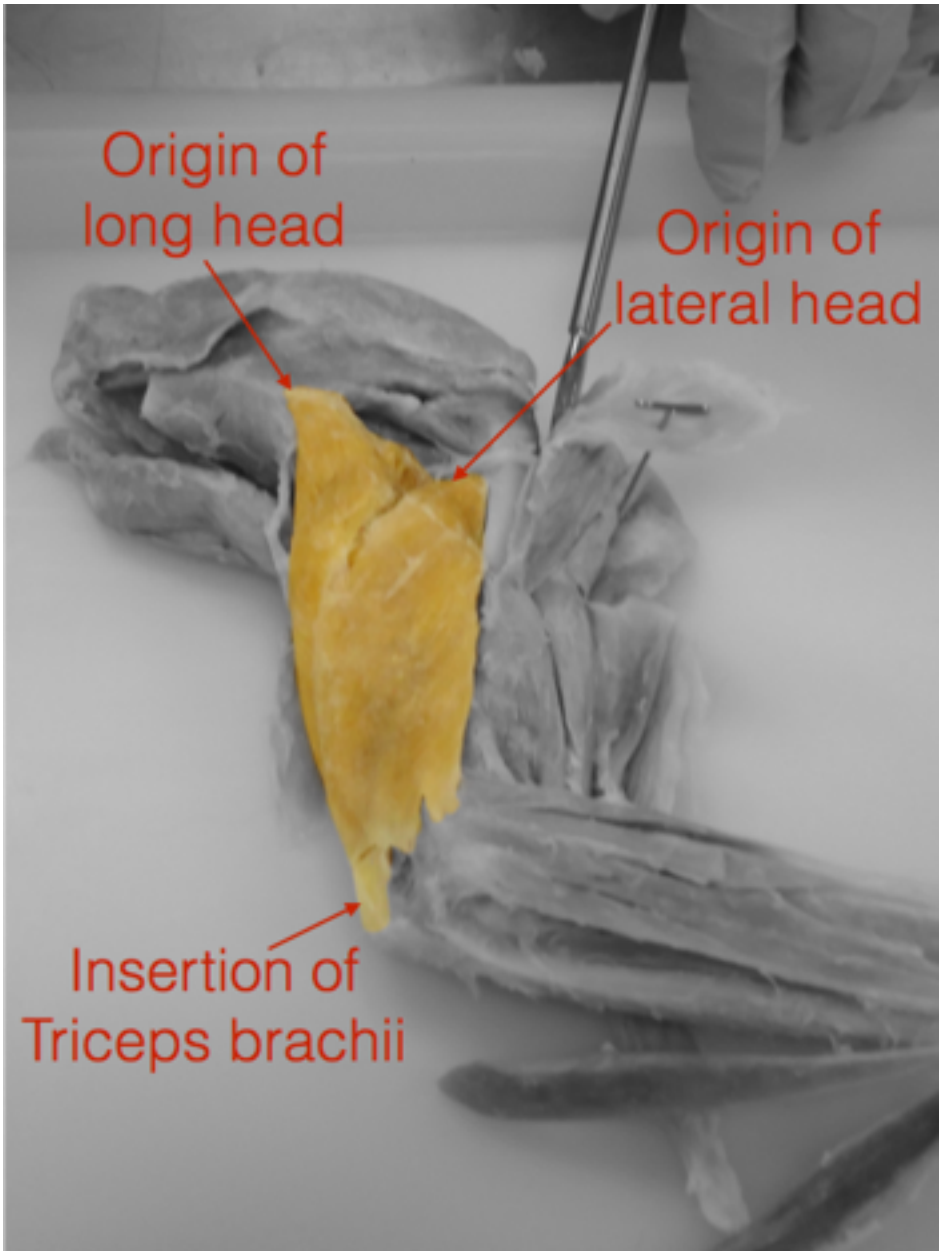

Figure 15: Triceps brachii m. (right; lateral view)

Anconeus lateralis

In *Macaca*, there are two anconeus muscles-- lateral anconeus and epitrochleoanconeus (described in forearm section)--both of which are functionally different from the anconeus muscle found in humans. Lateral anconeus has attachments on the lateral portion of the ulna just inferior to the olecranon process and on the radial portion of the elbow joint (Figure 16). This muscle is thought to assist triceps brachii in arm extension.

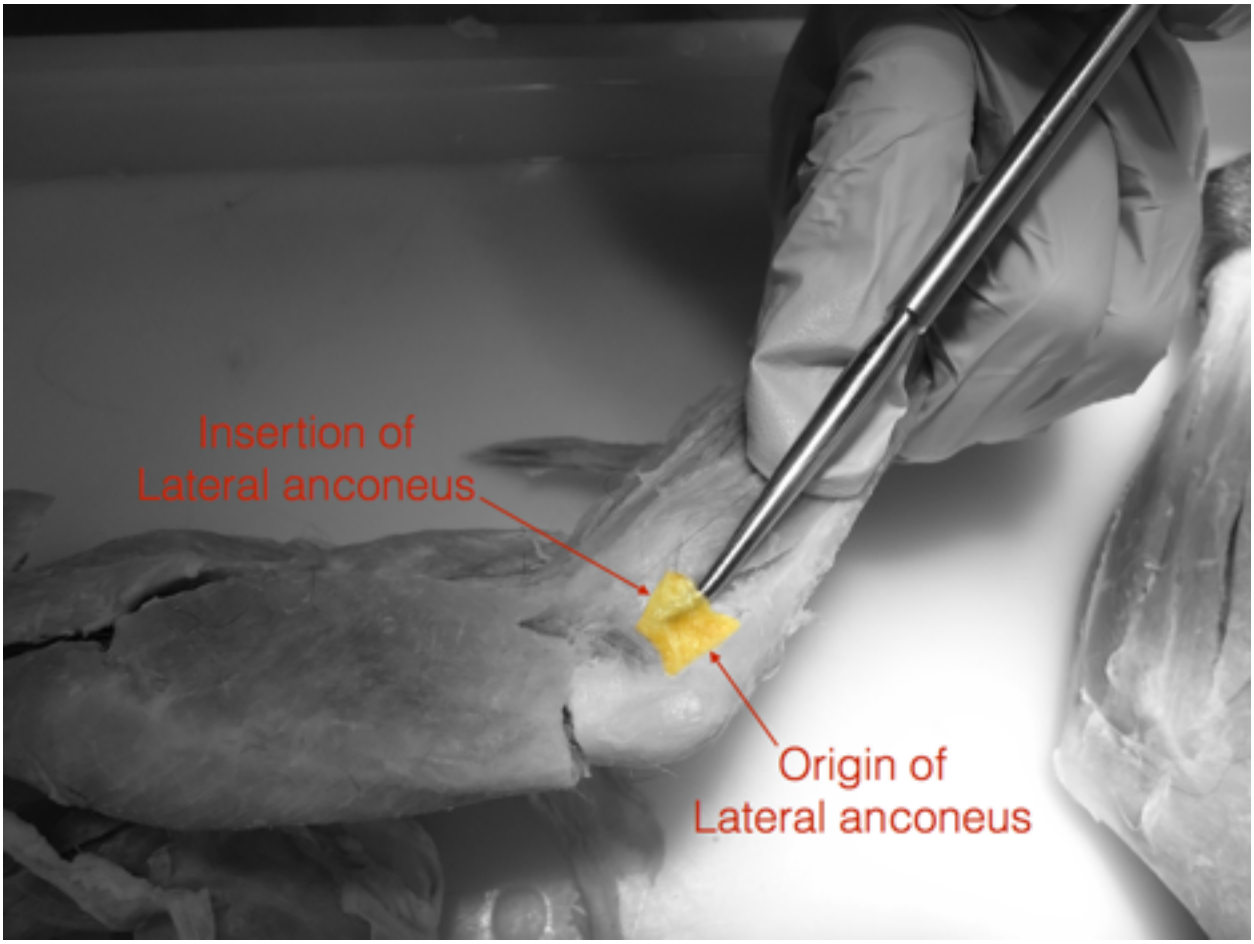

Figure 16: Anconeus lateralis m. (right; lateral view)

Muscles of the Forearm

Flexors

Flexor carpi radialis

This muscle is functionally equivalent in human and *Macaca*. It originates at the medial epicondyle of the humerus and attaches to the base of the second and/or third metacarpal (Figure 17; Howell and Straus, 1933).

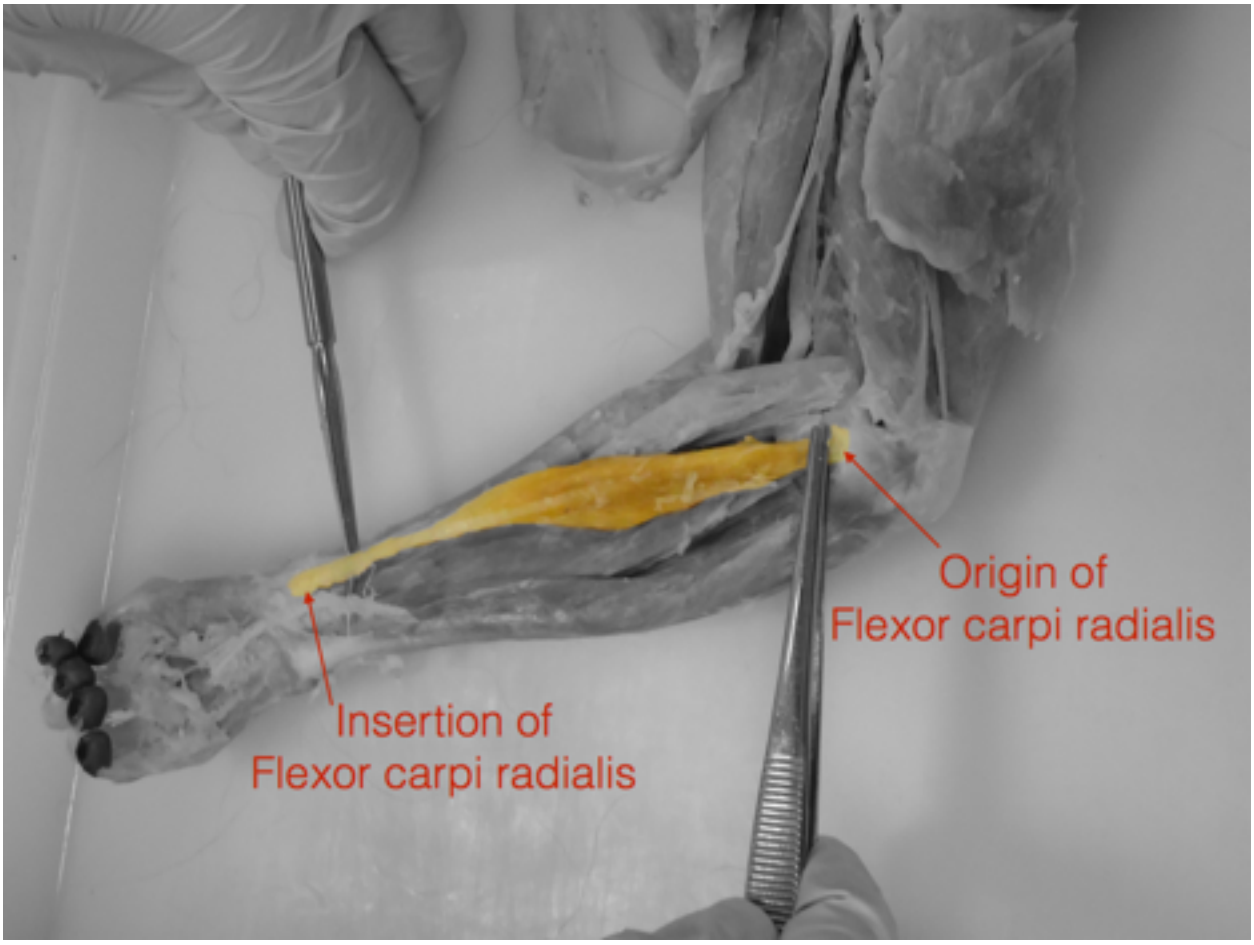

Figure 17: Flexor carpi radialis m. (right; anterior view)

Palmaris longus

Palmaris longus is proportionately larger in *Macaca* than it is in humans (Howell and Straus, 1933) but functions in the same way. This muscle originates from the medial epicondyle of the humerus and inserts on the palmar aponeurosis (Figure 18).

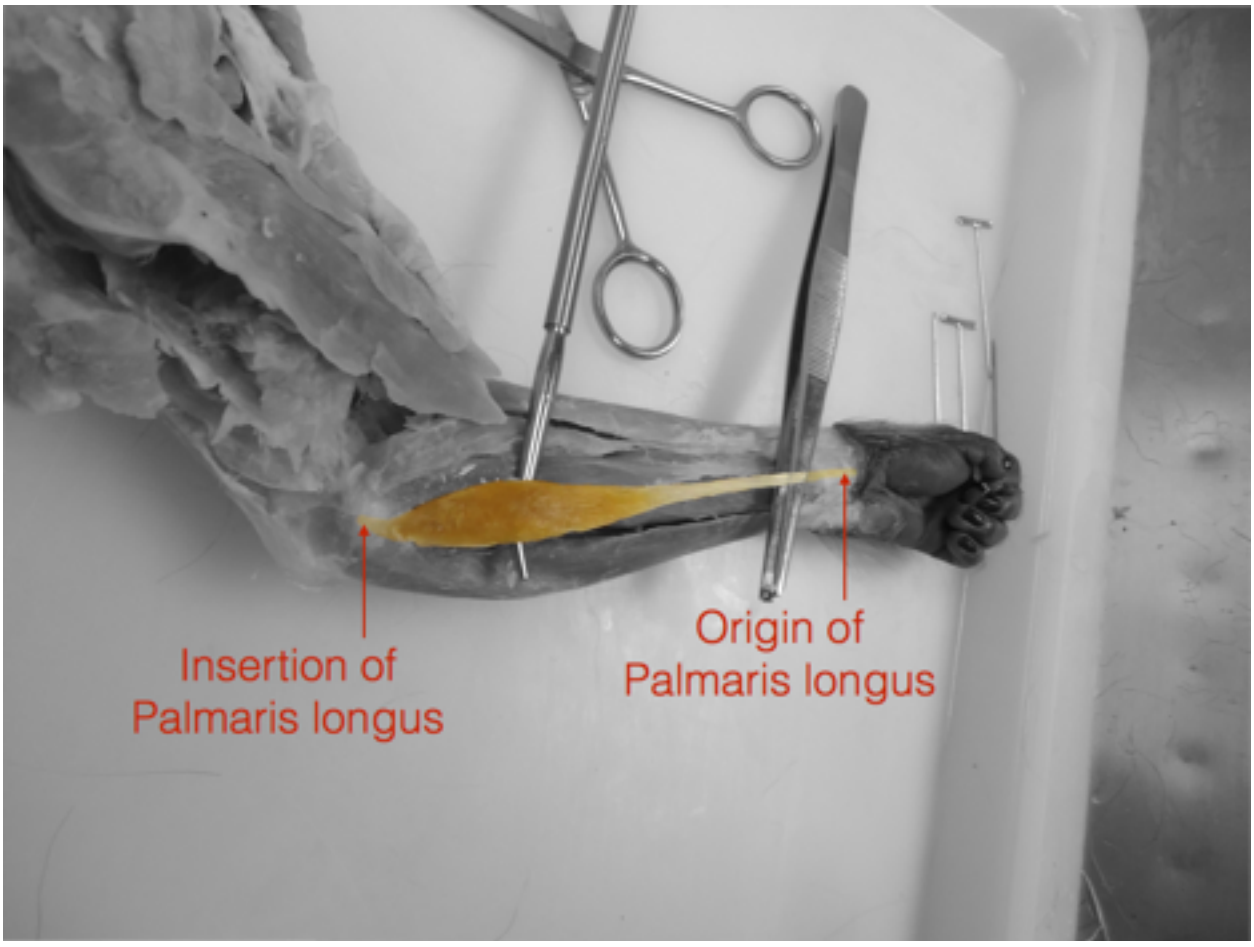

Figure 18: Palmaris longus m. (left; anterior view)

Flexor carpi ulnaris

This muscle originates from the medial epicondyle of the humerus and attaches to the pisiform and the base of the fifth metacarpal (Figure 19). It does not differ significantly between human and macaque.

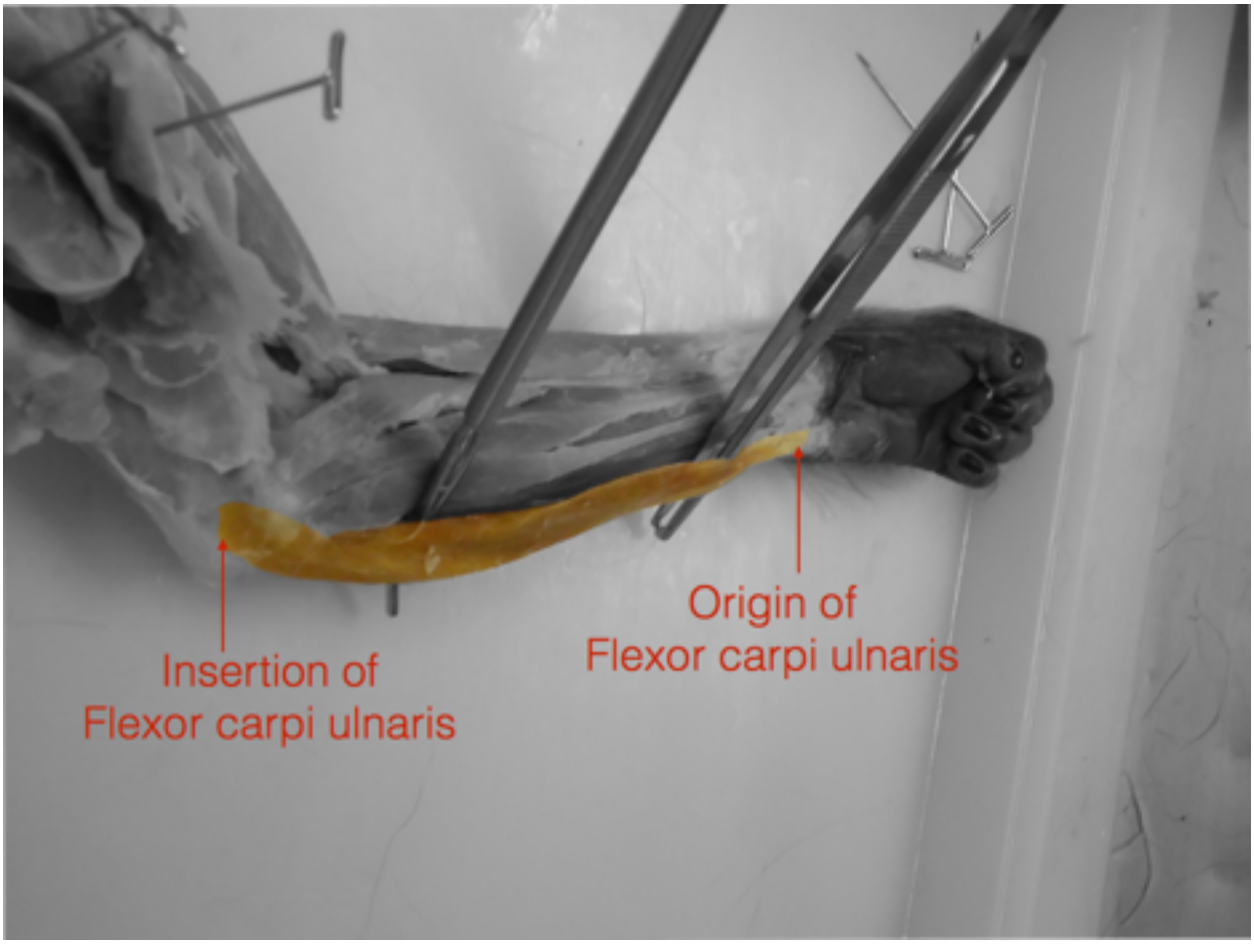

Figure 19: Flexor carpi ulnaris m. (left; anterior view)

Epitrochleoanconeus

Epitrochleoanconeus is absent in humans and is only present in some *Macaca* specimens (Howell and Straus, 1933). It originates from the medial epicondylar ridge of the humerus and inserts onto the olecranon process of the ulna (Figure 20). It is believed to aid in pronation and supination of the forearm but may primarily function to protect the ulnar nerve (Kimura and Takai, 1970).

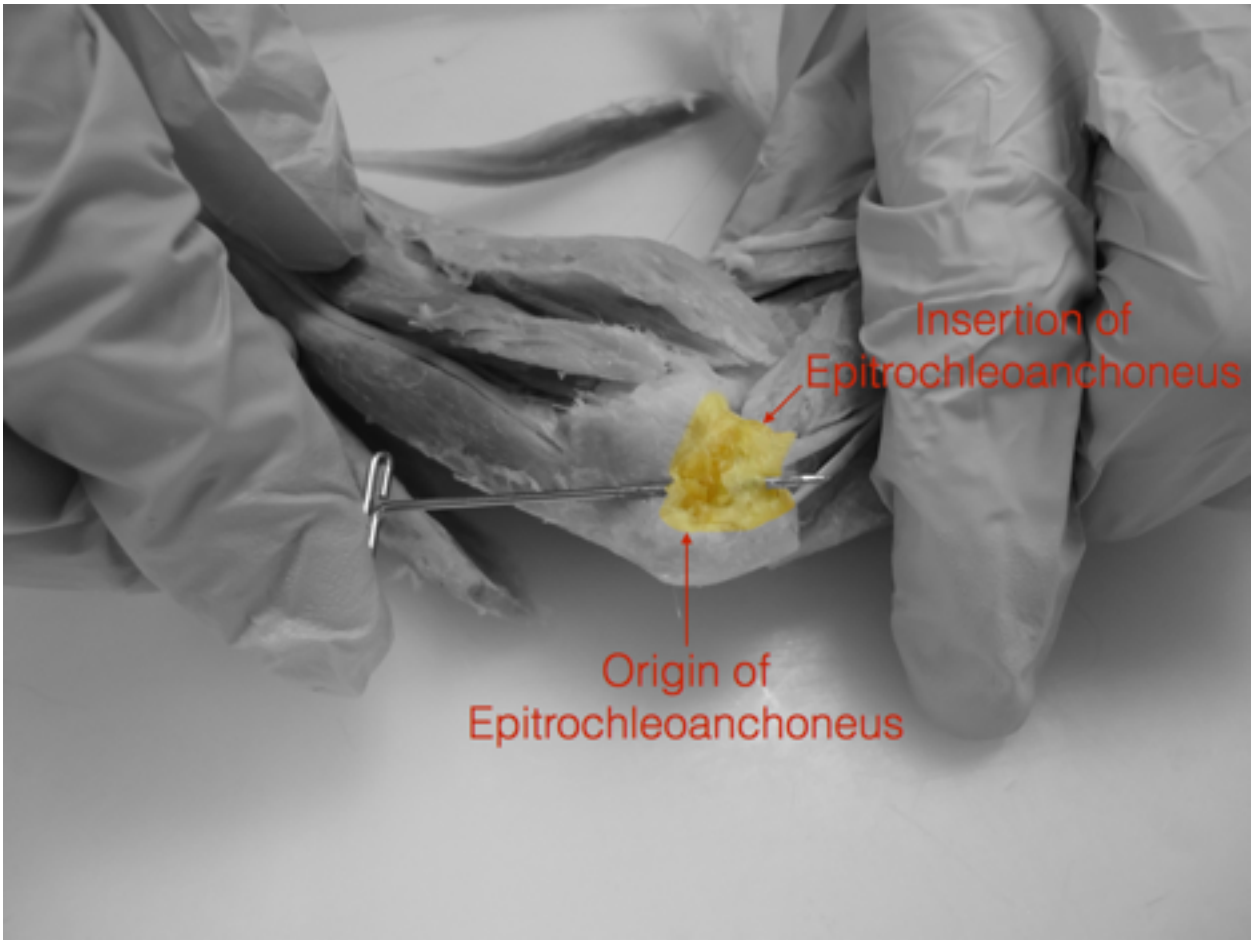

Figure 20: Epitrochleoanconeus m. (right; medial view)

Flexor digitorum sublimis

This muscle in functionally similar to flexor digitorum superficialis in humans and makes up the intermediate layer of the forearm flexors. It originates from the medial epicondyle of the humerus and attaches to the middle phalanges of digits two through four (Figure 21). Flexor digitorum sublimis is often fused with the underlying flexor digitorum profundus (Kimura and Takai, 1970).

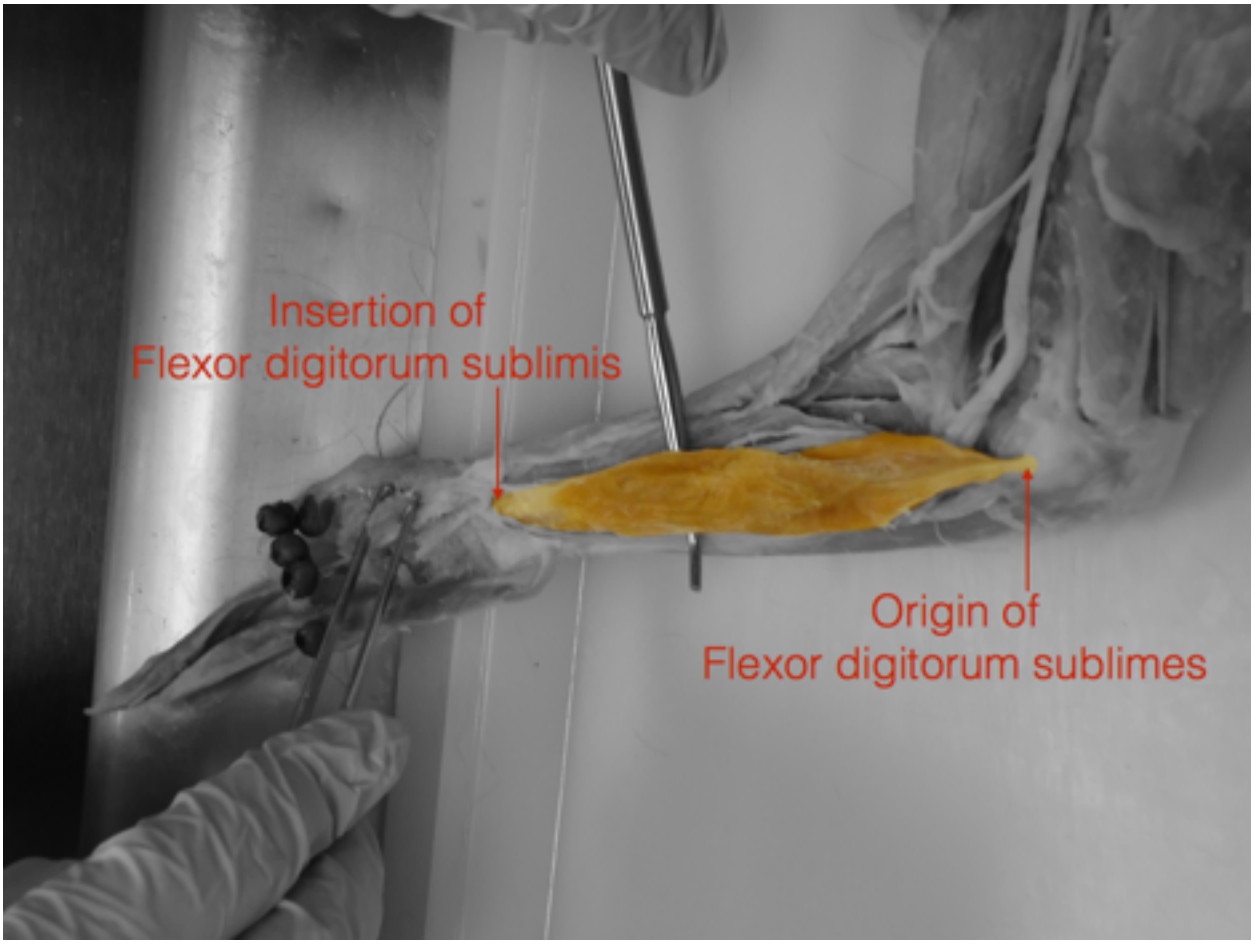

Figure 21: Flexor digitorum sublimis (right; anterior view; flexor carpi radialis, palmaris longus, and flexor carpi ulnaris cut and reflected inferiorly)

Flexor digitorum profundus

This muscle lies deep to flexor digitorum sublimis and does the work of flexor digitorum profundus and flexor pollucis longus found in humans. There is no separate flexor pollucis longus muscle in *Macaca* (Howell and Straus, 1933). It originates from the proximal two thirds of the ulna and attaches to the distal phalanges of digits one to five (Figure 22).

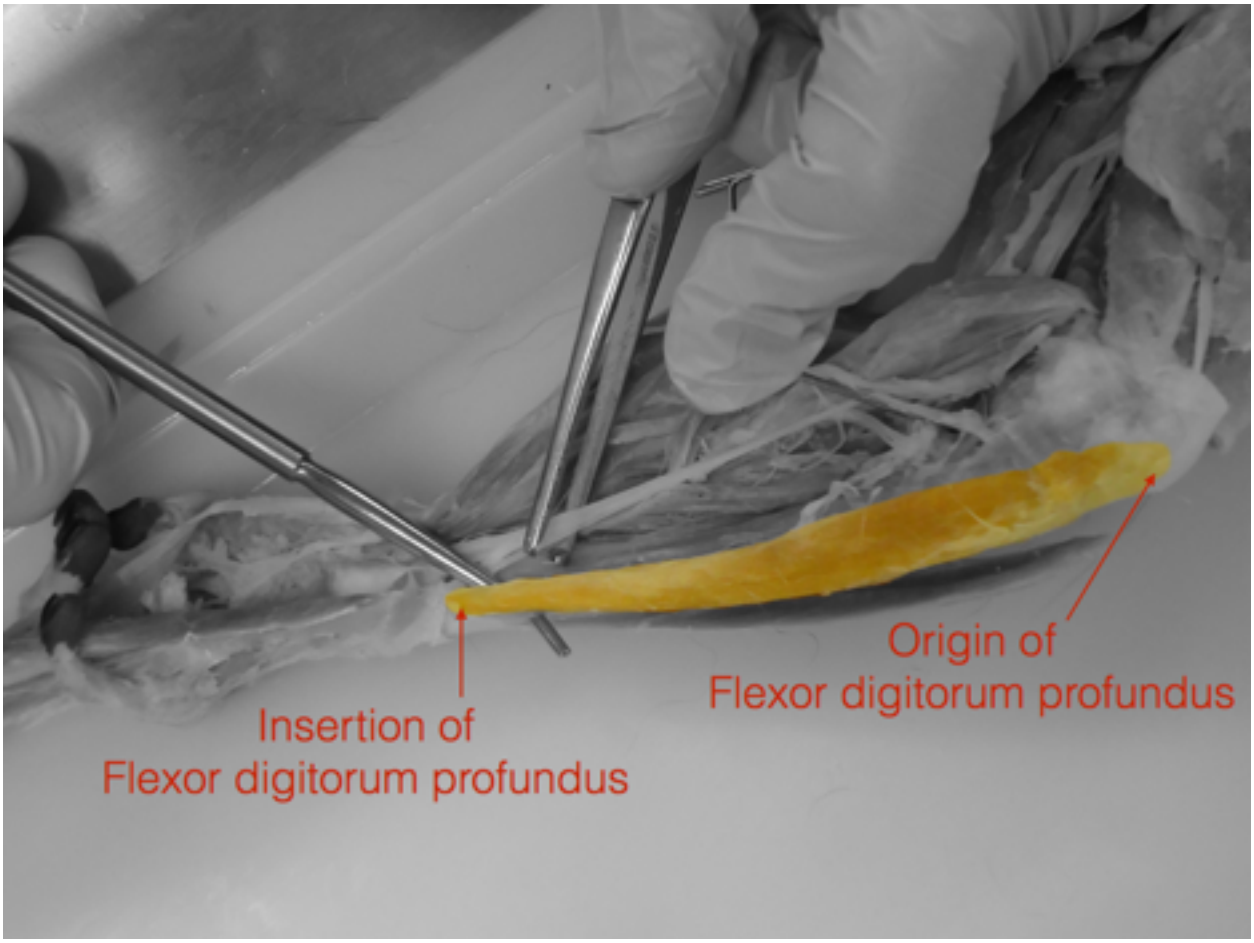

Figure 22: Flexor digitorum profundus m. (right; medial view; flexor digitorum sublimis reflected inferiorly.

Pronator quadratus

This muscle does not differ significantly between human and macaque. It attaches to the distal one third of the ulna to the distal one third of the radius (Figure 23).

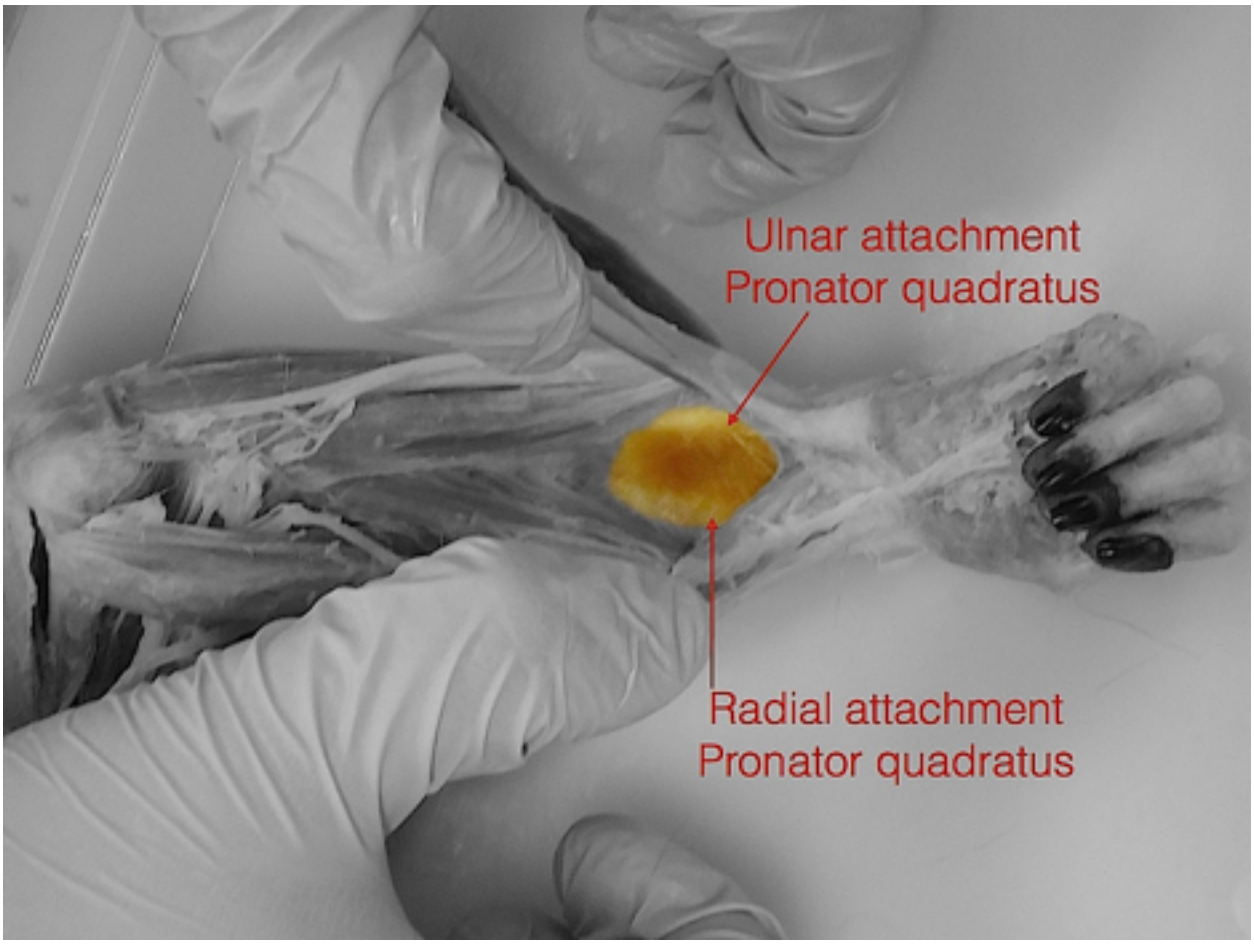

Figure 23: Pronator quadratus m. (right; anterior view; flexor digitorum profundus reflected)

Extensors

Brachioradialis

Brachioradialis originates on the lateral epicondylar ridge and distal aspect of the humeral shaft and attaches to the distal most portion of the radial shaft (Figure 24). It is functionally similar in *Macaca* and humans.

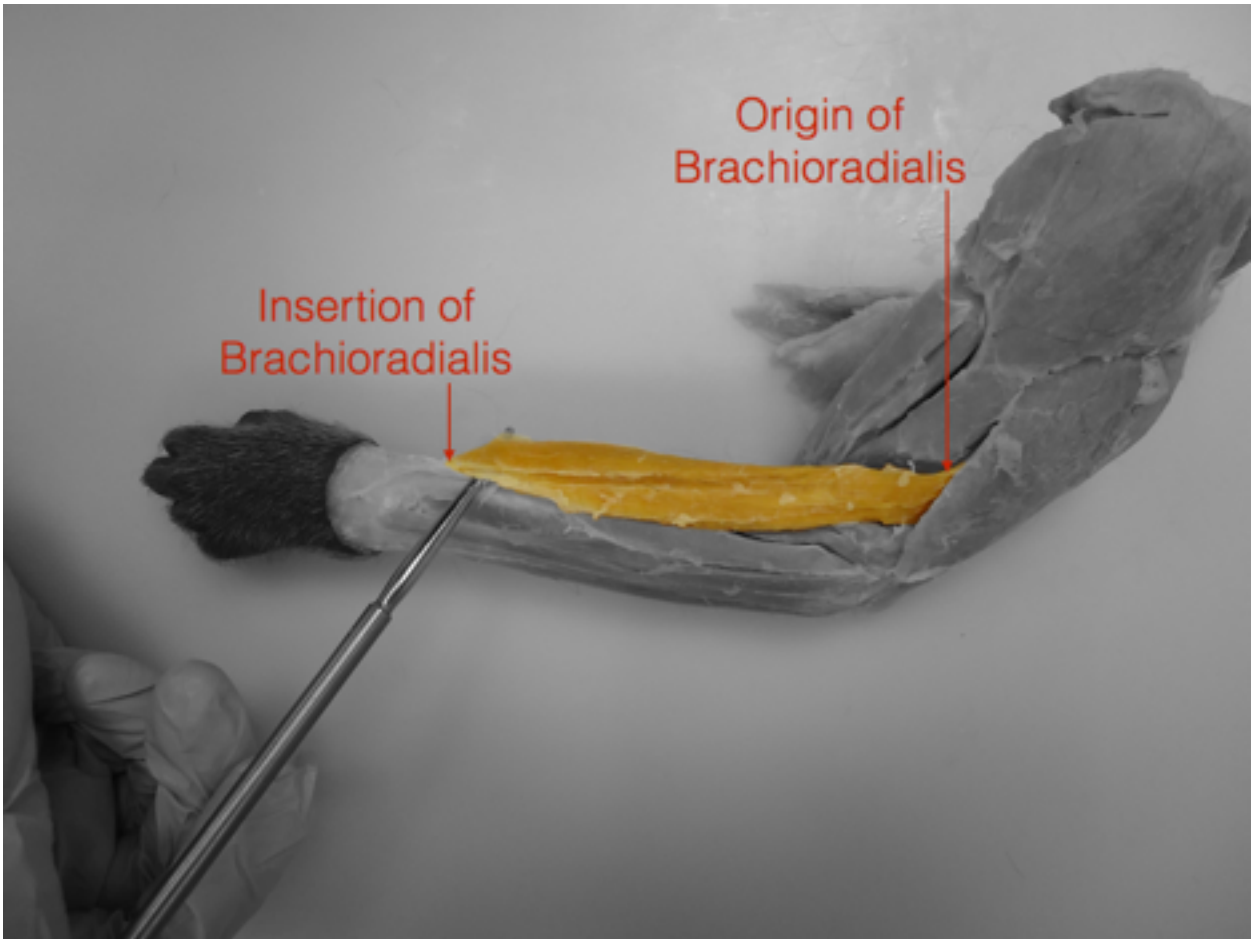

Figure 24: Brachioradialis m. (left; posterolateral view)

Extensor carpi radialis longus

This muscle originates from the supraepicondylar ridge of the humerus, attaches to the base of the second metacarpal, and does not differ greatly between macaque and human (Figure 25).

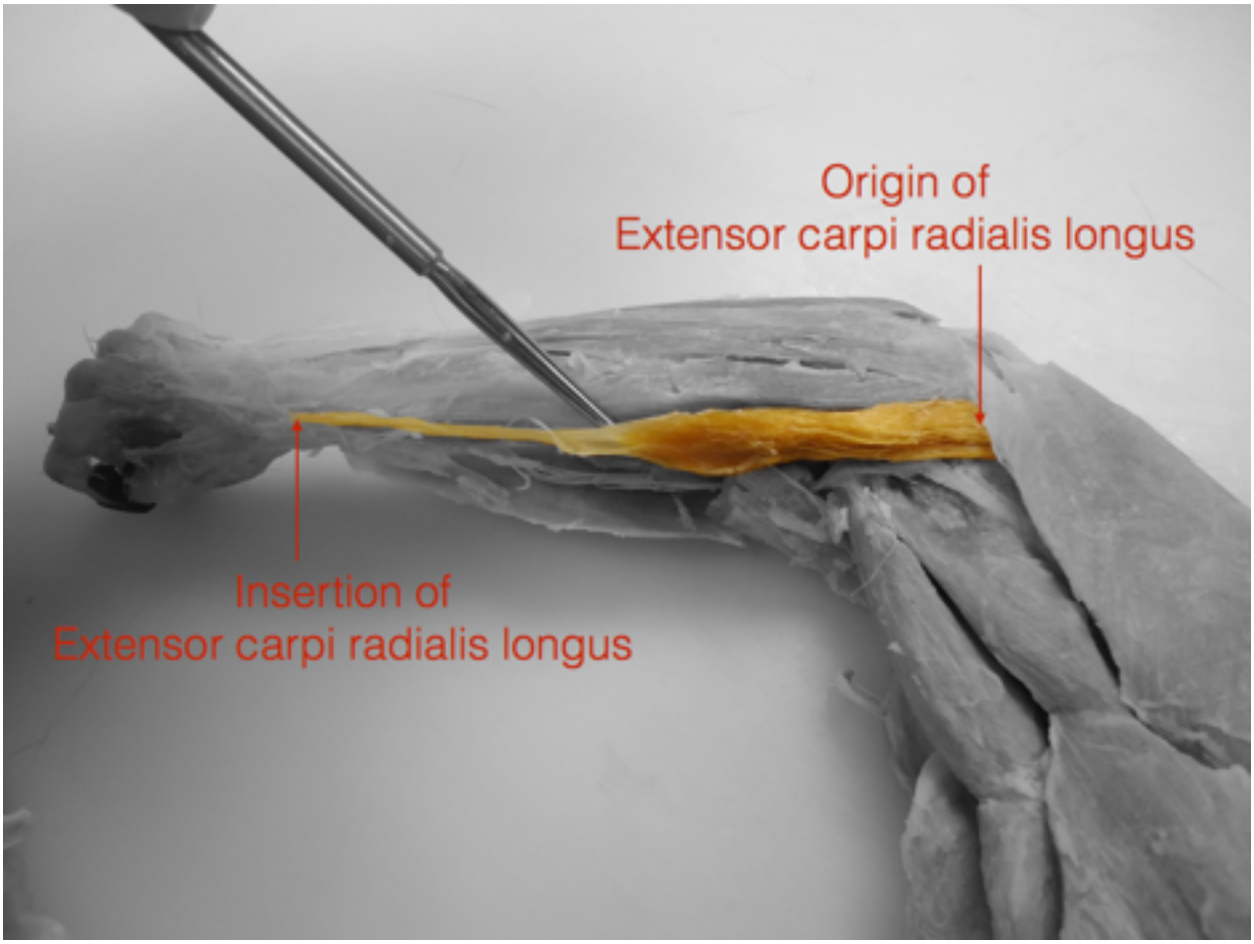

Figure 25: Extensor carpi radialis longus m. (right; posterolateral view; brachioradilais m. removed)

Extensor carpi radialis brevis

Extensor carpi radialis brevis originates from the lateral epicondyle of the humerus and attaches to the base of the third metacarpal (Figure 26). This configuration is identical to that of humans.

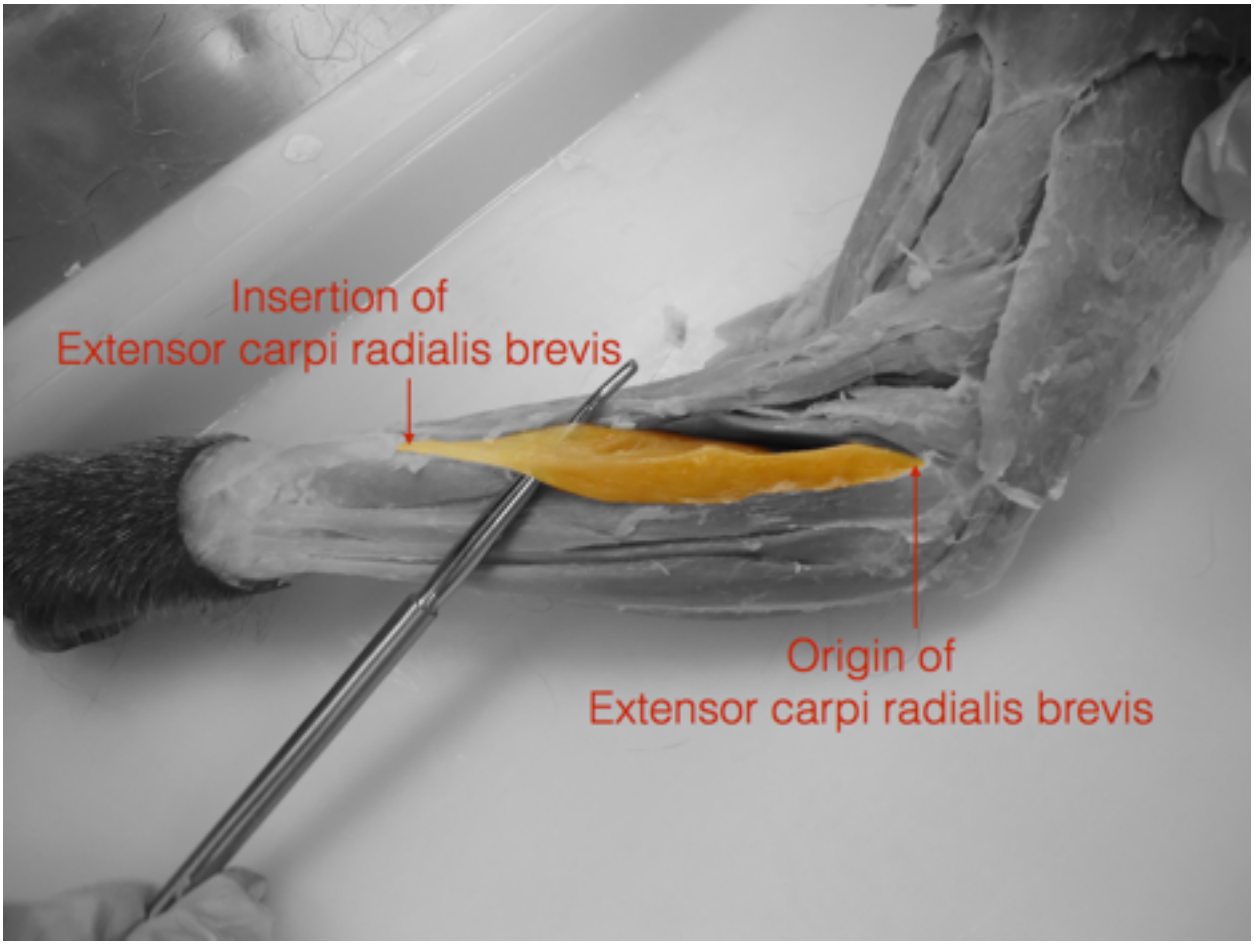

Figure 26: Extensor carpi radialis brevis m. (left; posterolateral view)

Extensor digitorum communis

This muscle is functionally similar to that of extensor digitorum in humans. It originates from the lateral epicondyle of the humerus and attaches to the middle and/or distal phalanges of digits II-IV (Figure 27). The distal extent of the extensor digitorum communis tendons were not recorded in this study but others have found they extend to the middle and distal most phalanges as in humans (Kimura and Takai, 1970) while others report their extension only as far as the middle phalanges (Howell and Straus, 1933).

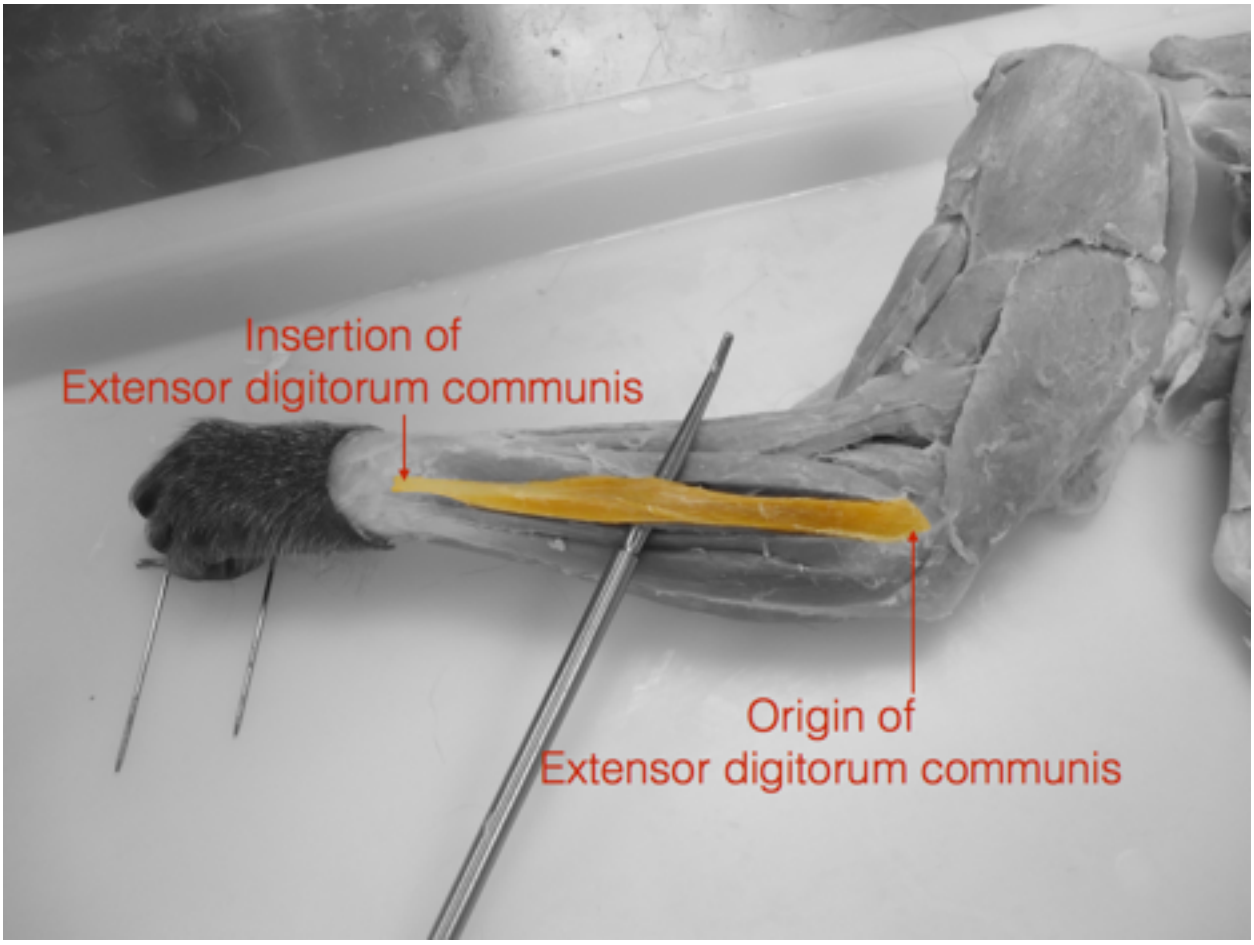

Figure 27: Extensor digitorum communis m. (left; posterolateral view)

Extensor digiti quarti proprius and extensor digiti quinti proprius

In humans, extensor digiti minimi extends from the lateral epicondyle of the humerus to the base of proximal phalanx of the fifth digit. Somewhat similarly, the common muscle belly of extensor digiti quarti proprius and extensor digiti quinti proprius extend from the lateral epicondyle of the humerus (Figure 28A) but splits into two distinct tendons near the wrist (Figure 28B). The tendon for extensor digiti quarti proprius attaches to the basal phalanx of digit IV while the tendon for extensor digiti quinti proprius attaches to the middle phalanx of digit V.

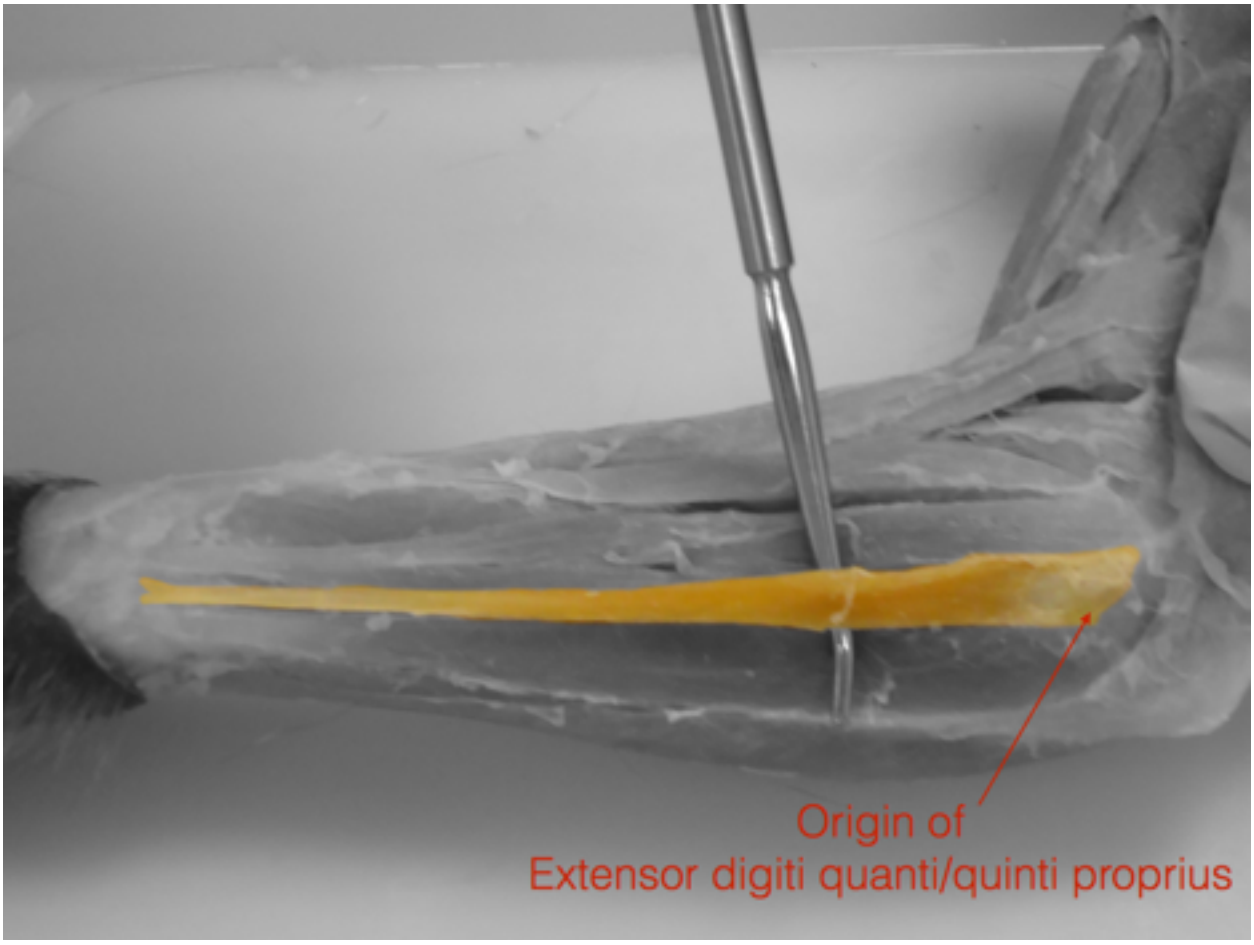

Figure 28A: Extensor digiti quarti proprius m. and extensor digiti quinti proprius m. (left; posterolateral view)

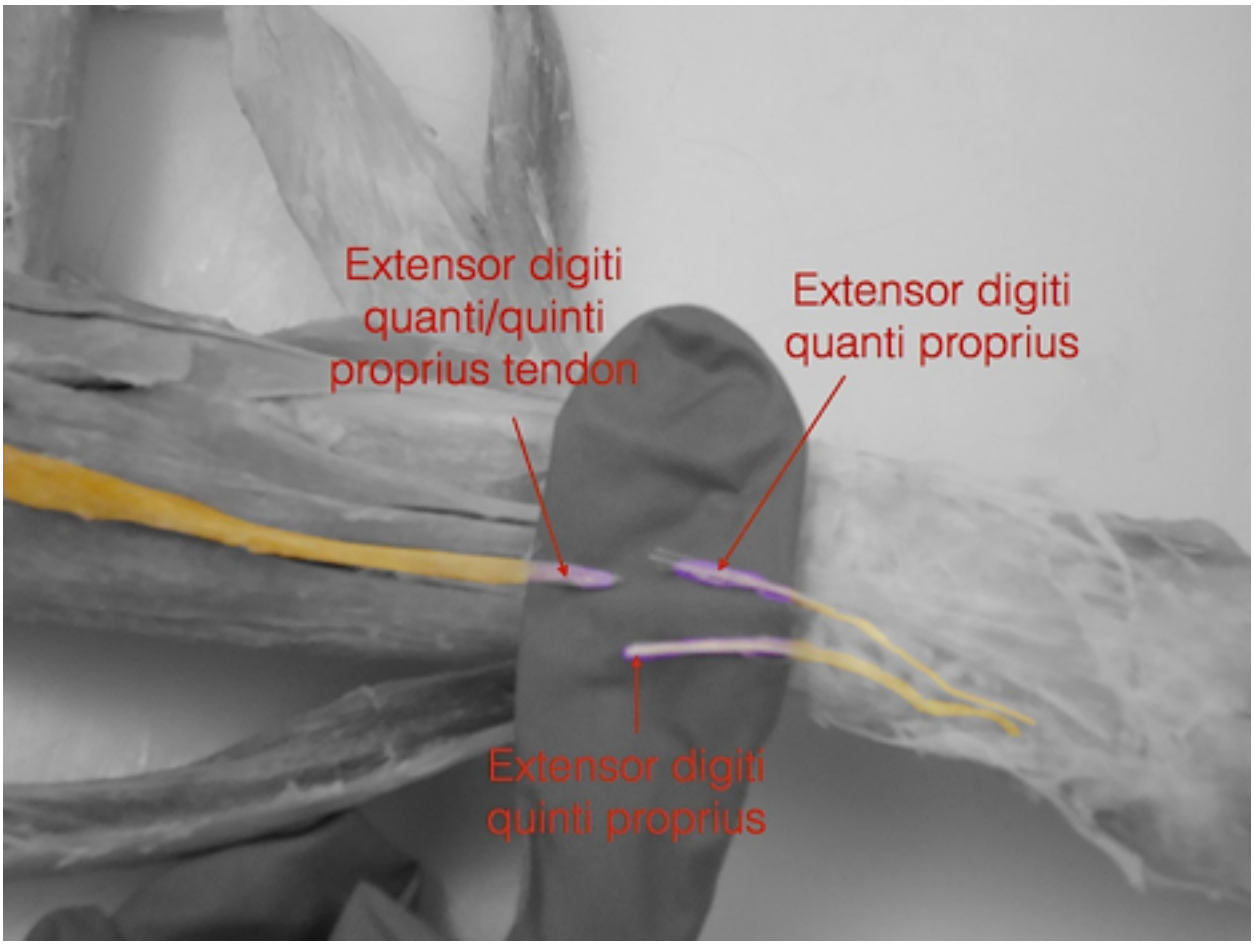

Figure 28B: Extensor digiti quarti proprius m. and extensor digiti quinti proprius m. (right; posterolateral view)

Extensor carpi ulnaris

In humans and *Macaca*, this muscle originates from the lateral epicondyle of the humerus and inserts onto the base of the fifth metacarpal (Figure 29).

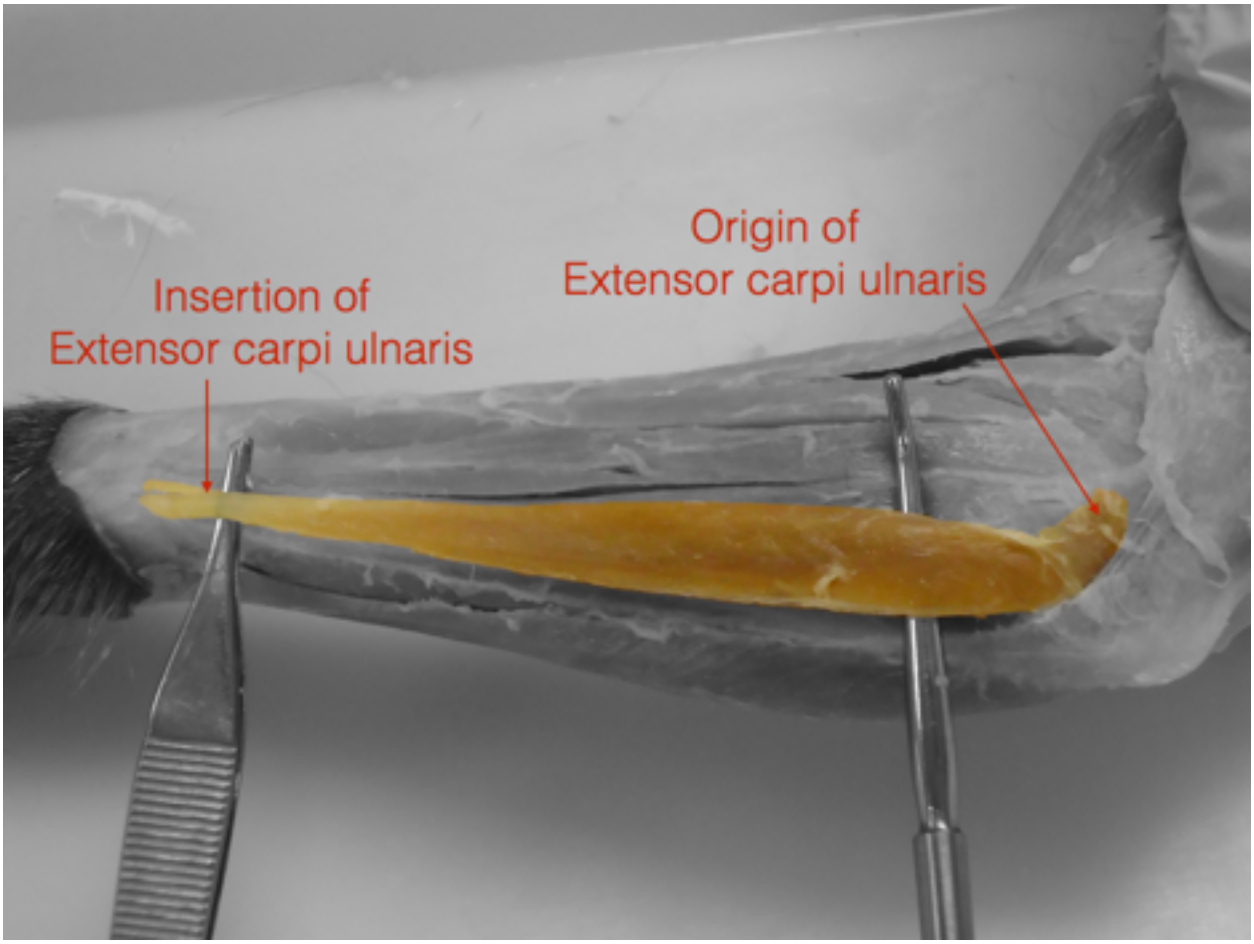

Figure 29: Extensor carpi ulnaris m. (left; posterolateral view)

Supinator

Supinator originates from the lateral epicondyle of the humerus and the distal portion of the proximal most aspect of the ulna. It attaches to the proximal half of the radial shaft (Figure 30). This muscle is functionally similar in humans and macaques.

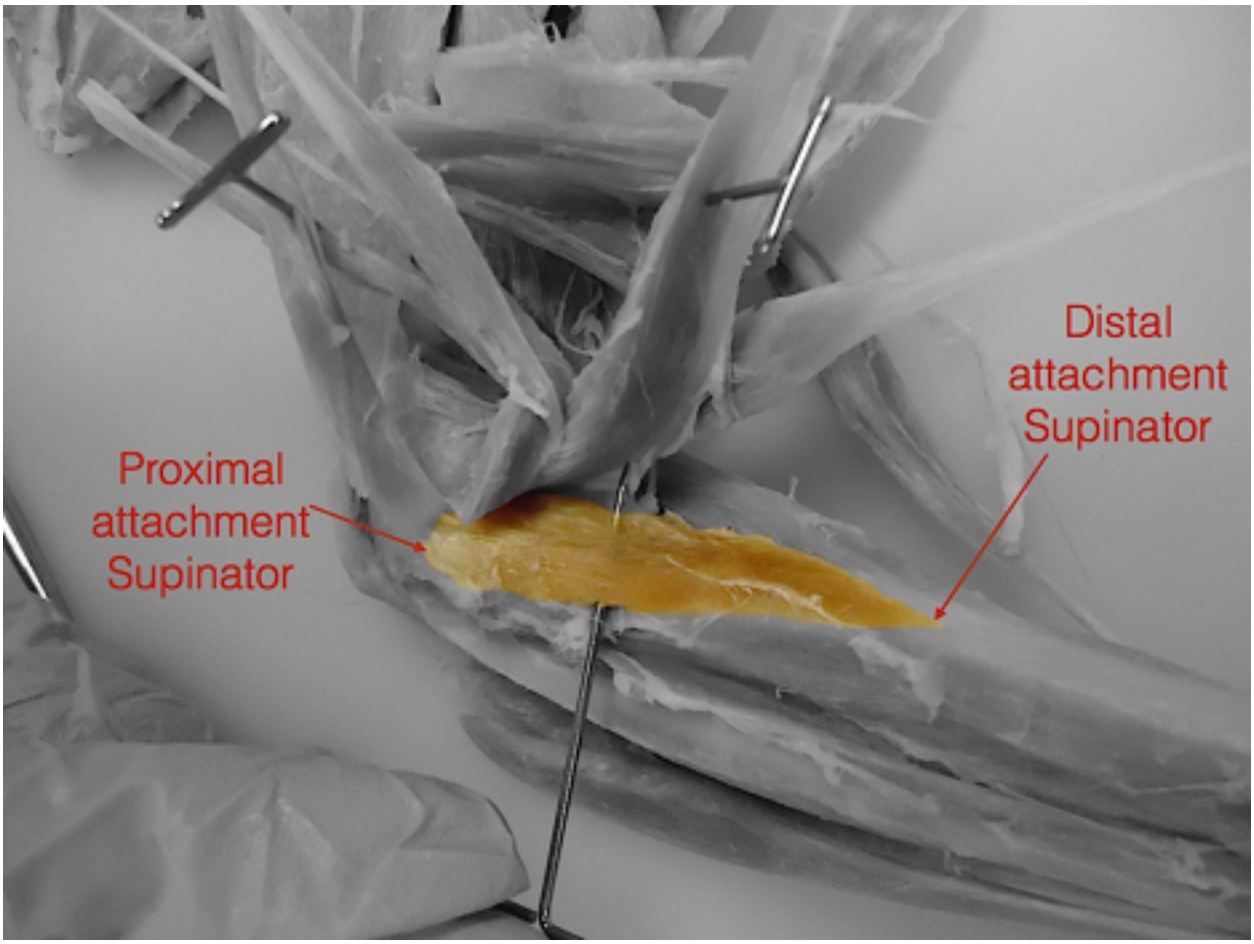

Figure 30: Supinator m. (right; lateral view; brachioradialis m., extensor carpi radialis longus m., and extensor carpi radialis brevis reflected supero-laterally)

Abductor pollucis longus

This muscle originates from the lateral border of the ulna, the proximal half of the radius, and the interosseous membrane (Figure 31). It attaches to the base of the first metacarpal. Abductor pollucis longus is functionally similar in humans and macaques.

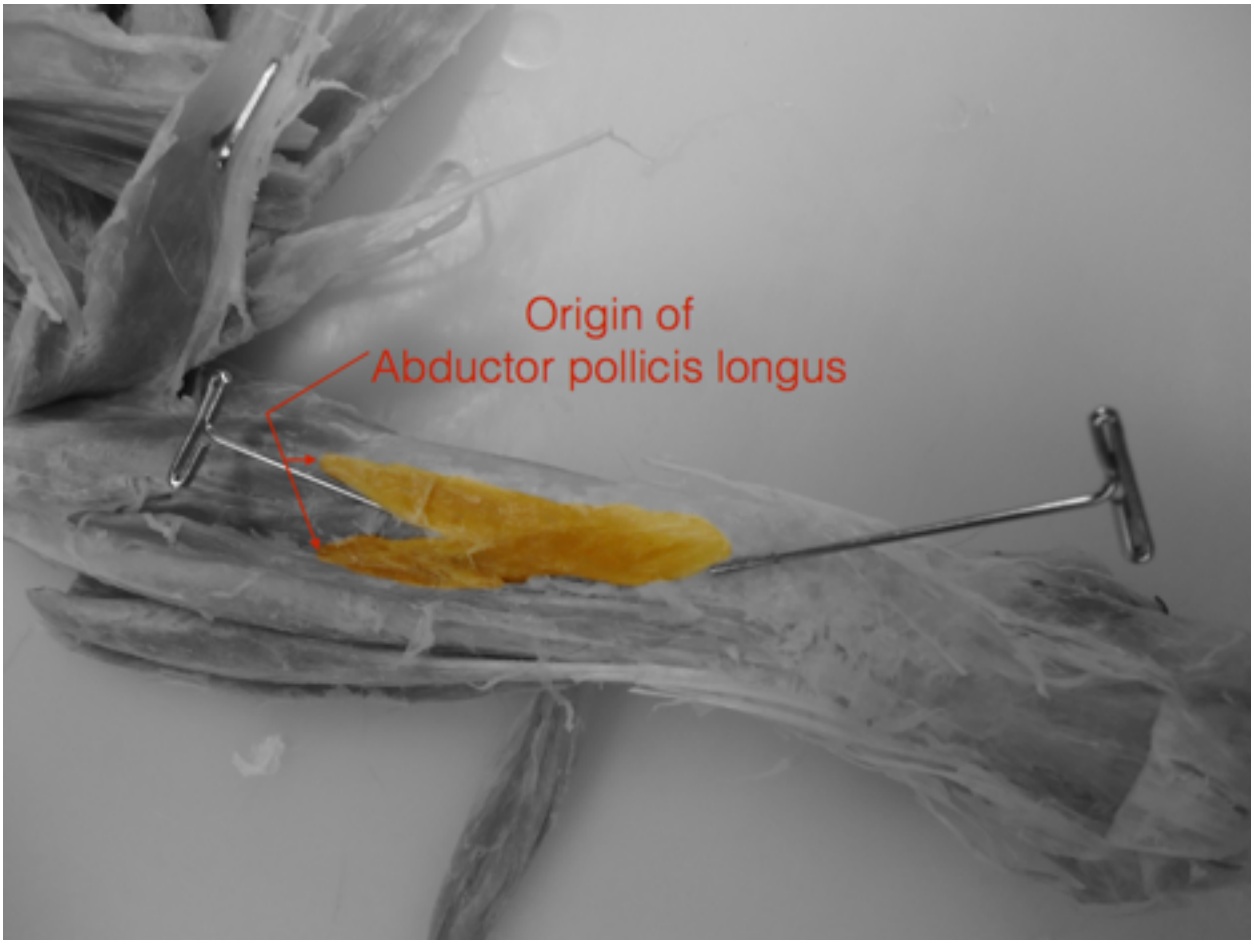

Figure 31: Abductor pollucis longus m. (right; posterior view; brachioradialis m., extensor carpi radialis longus m., and extensor carpi radialis brevis reflected supero-laterally)

Extensor pollicis longus

This muscle originates from the middle third of the dorsal surface of the ulna and attaches to the distal phalanx of the thumb (Figure 32). This configuration is similar to that of humans; however, extensor digitorum brevis (present in humans) is absent in the crab-eating macaque.

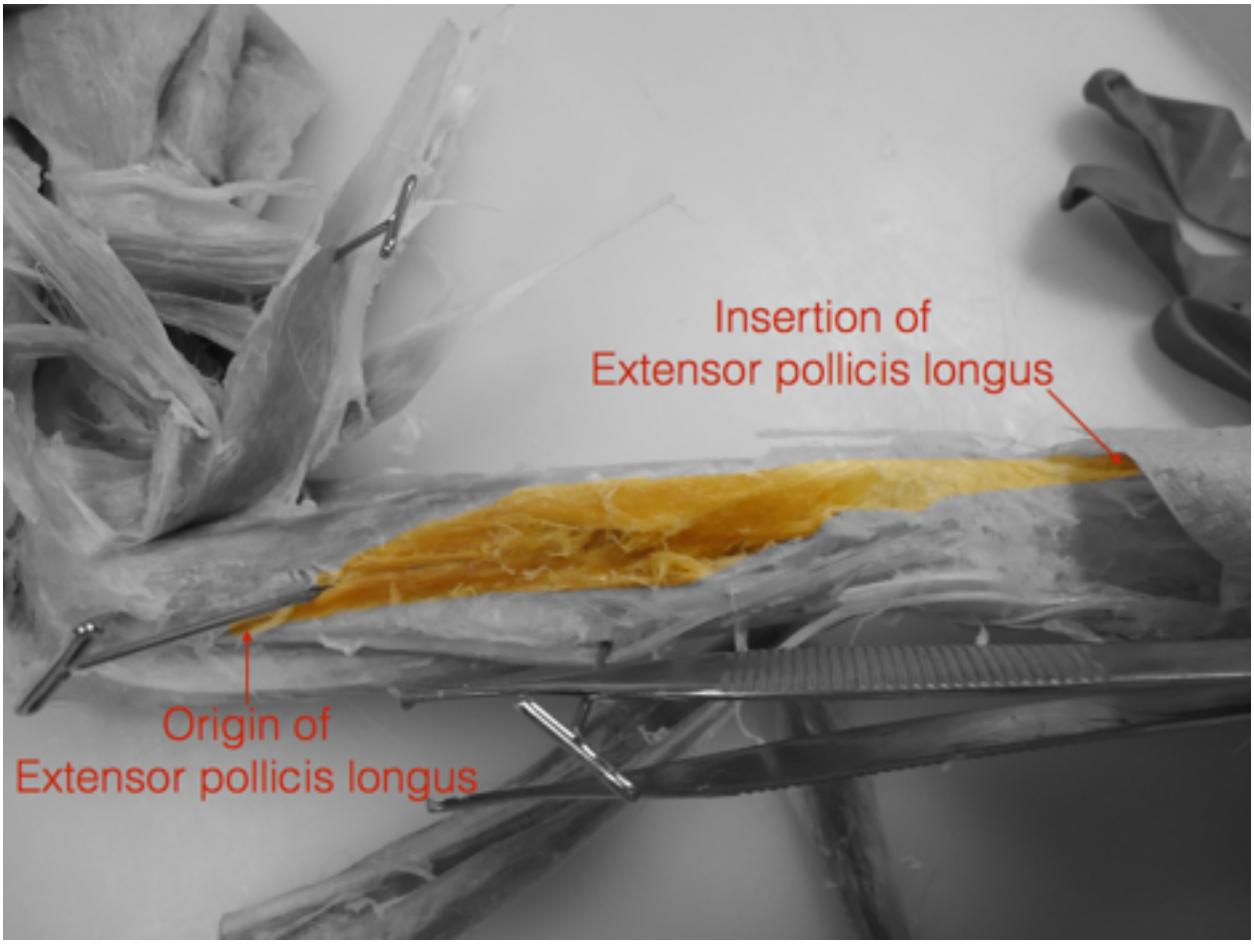

Figure 32: Extensor pollicis longus m. (right; posterior view; brachioradialis m., extensor carpi radialis longus m., and extensor carpi radialis brevis reflected supero-laterally)

Extensor digiti secondi m. and extensor digiti tertii proprius

These two muscles are not present in humans and act to extend to digits II and III. Extensor digiti secondi m. and extensor digiti tertii proprius originate from a common muscle belly from the lateral side of the proximal third of the ulna (Figure 33). They extend distally and split into the extensor digiti secondi which attaches at the basal phalanx of digit II and the extensor digiti tertii tendon which attaches to the basal phalanx of digit III.

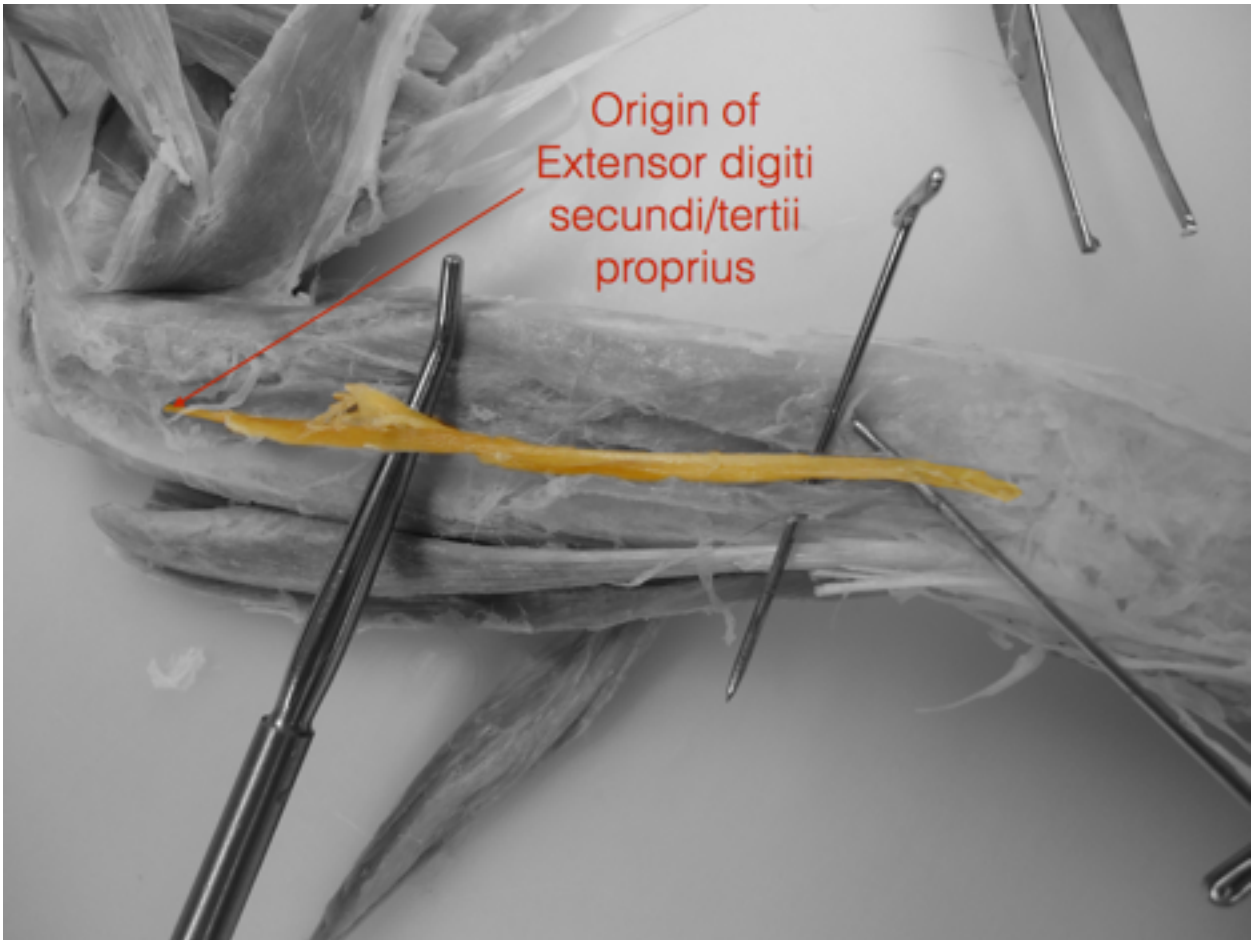

Figure 33: Extensor digiti secondi m. and extensor digiti tertii proprius m.

Superficial Dissection of Hindlimb

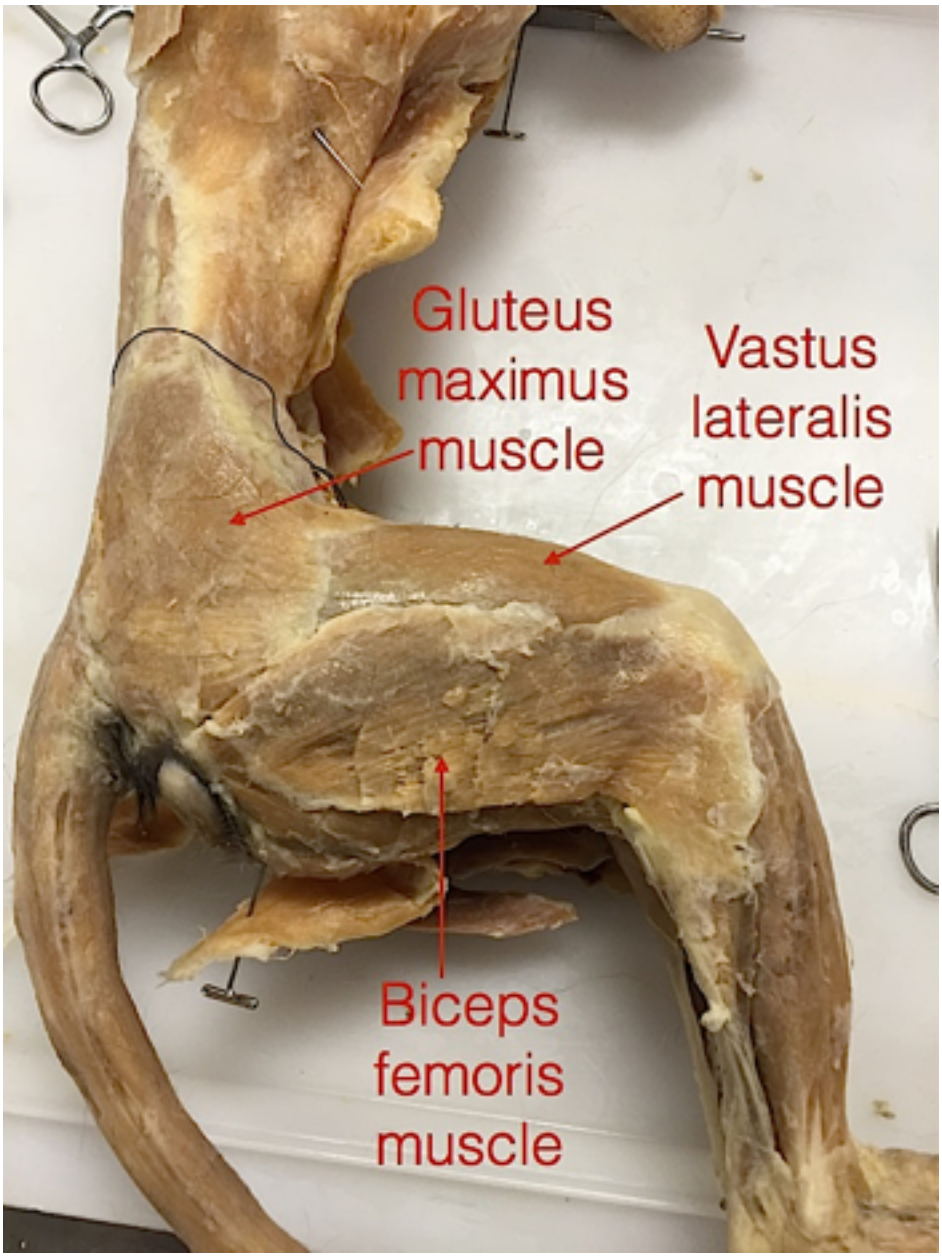

Figure 34: Superficial dissection of hip and thigh (right; lateral view)

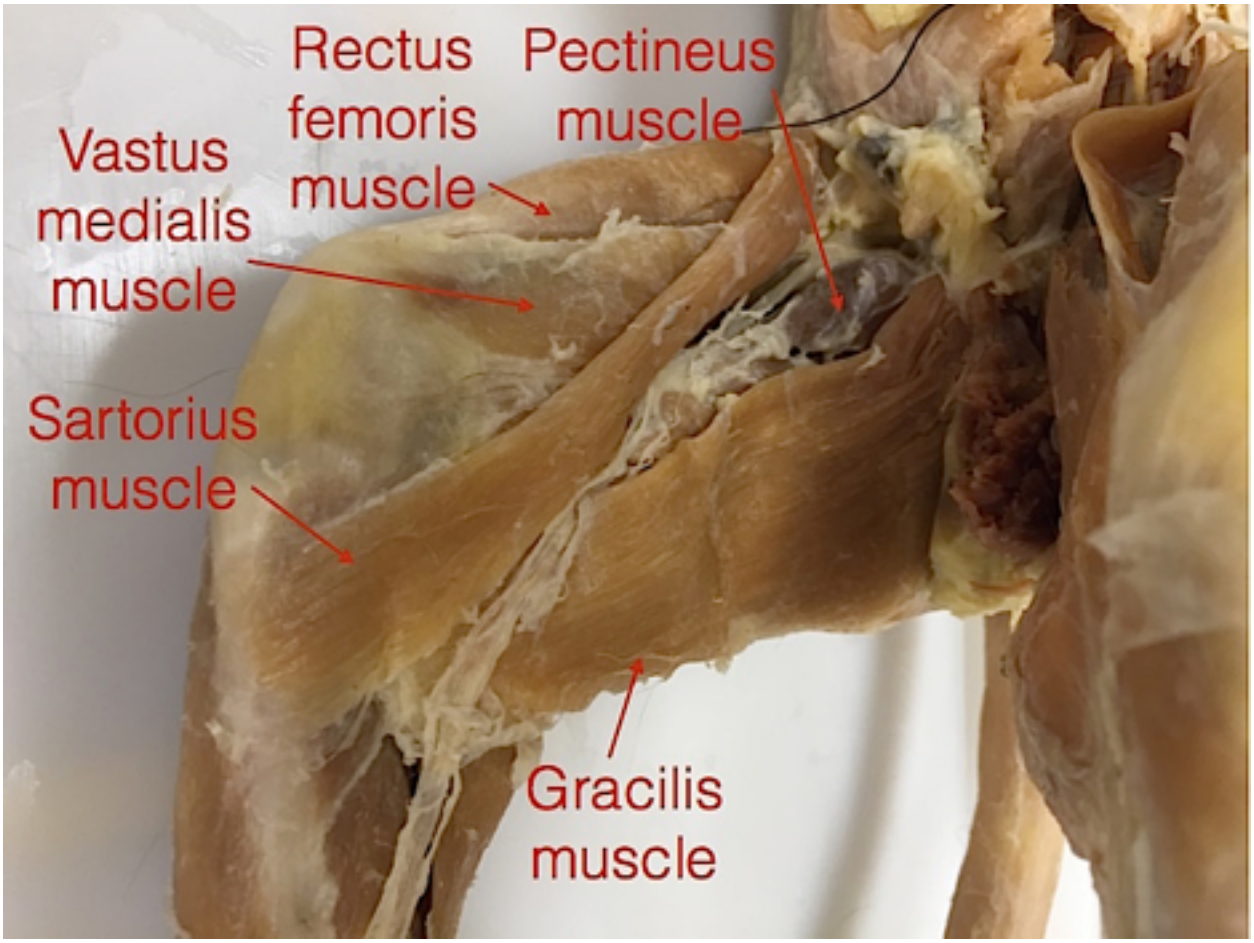

Figure 35: Superficial dissection of thigh (right; medial view)

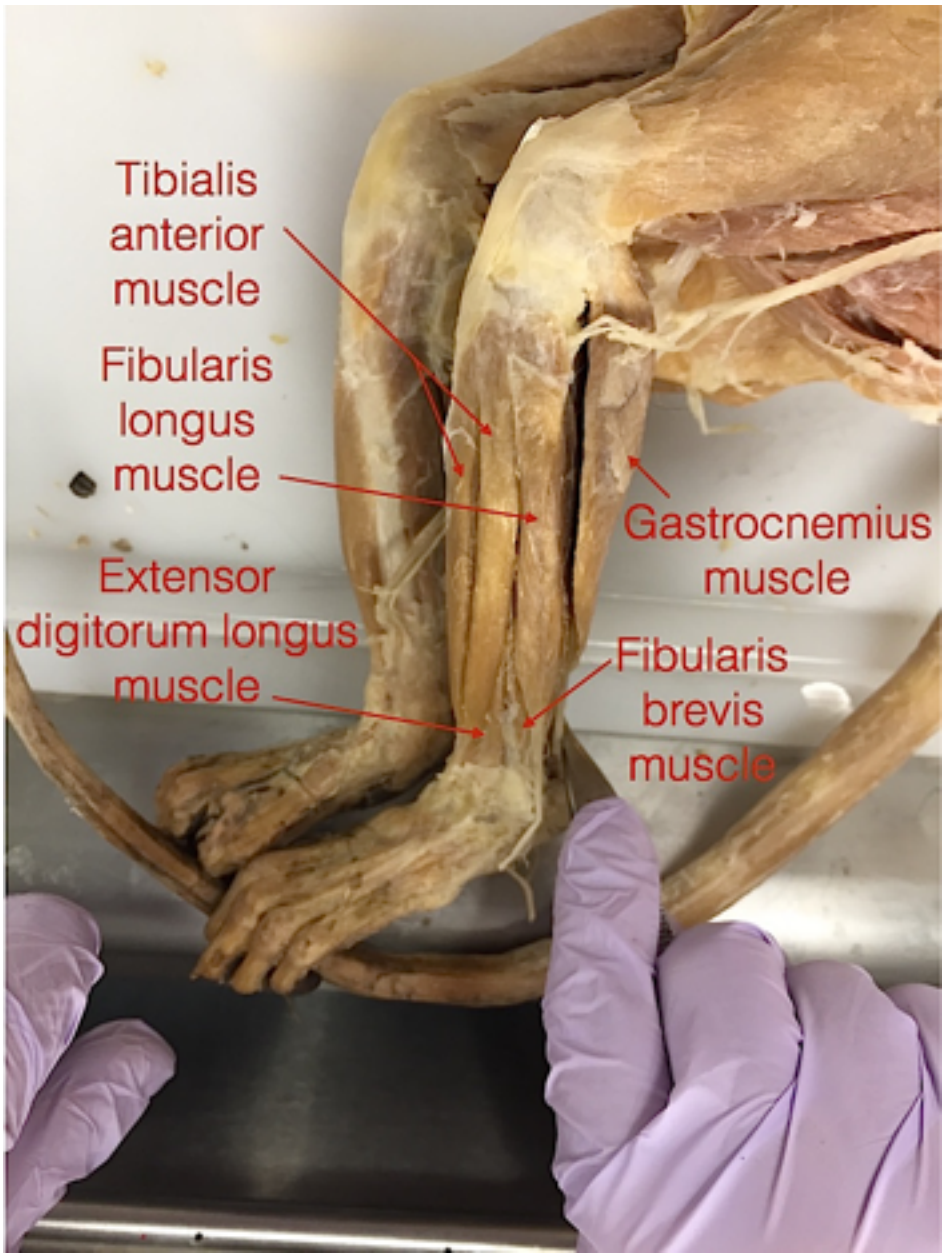

Figure 36: Superficial dissection of leg (left; anterolateral view)

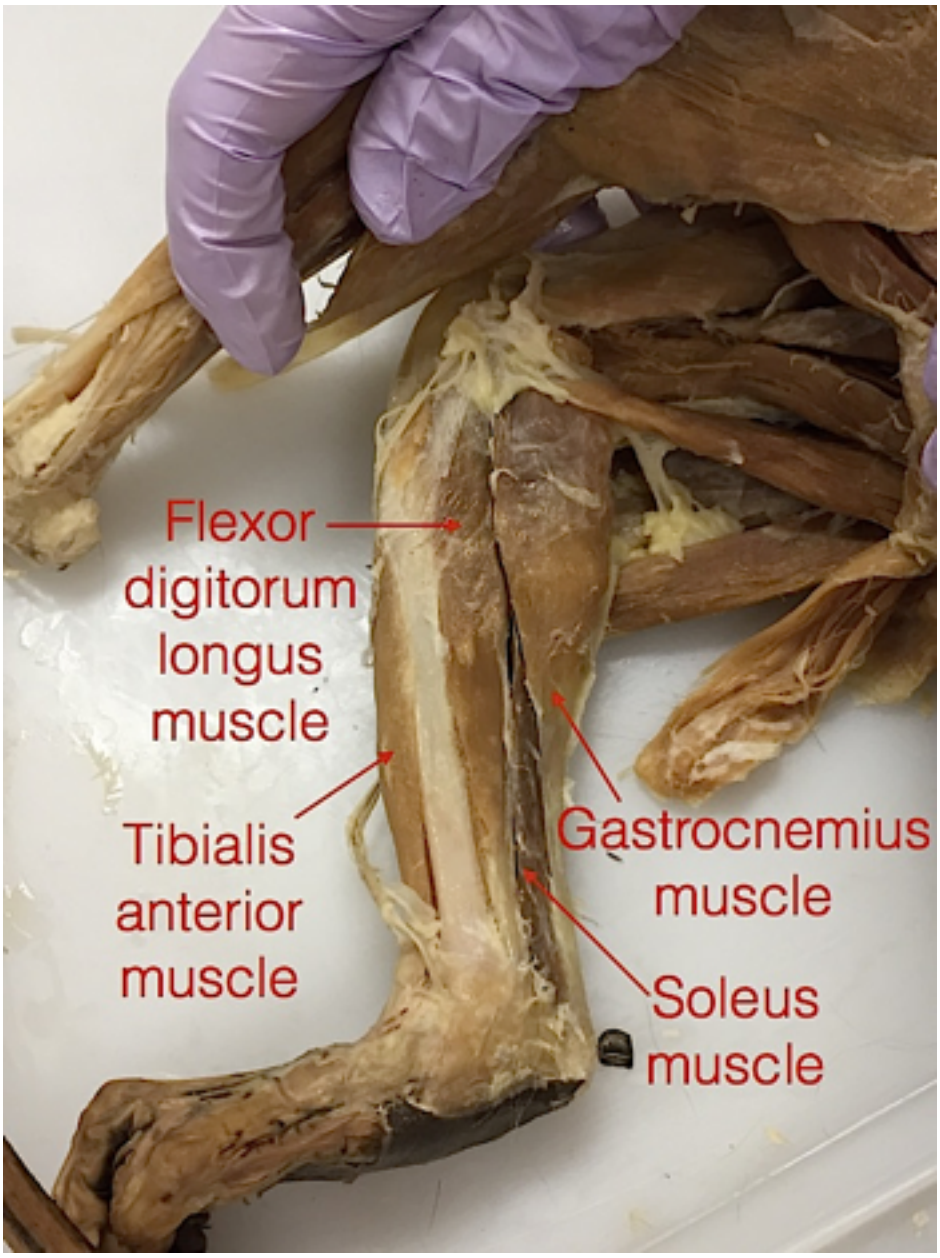

Figure 37: Superficial dissection of leg (right; medial view)

Muscles of the Hip

Iliopsoas

In humans and macaques, iliopsoas is actually composed of two muscles: psoas major and iliacus. Psoas major originates from the vertebral bodies and transverse processes of the seven lumbar vertebrae and merges with iliacus in the pelvis (Figure 38). Iliacus originates from the ventral surface of the ilium and inserts (along with fibers of psoas major) onto the lesser trochanter of the femur.

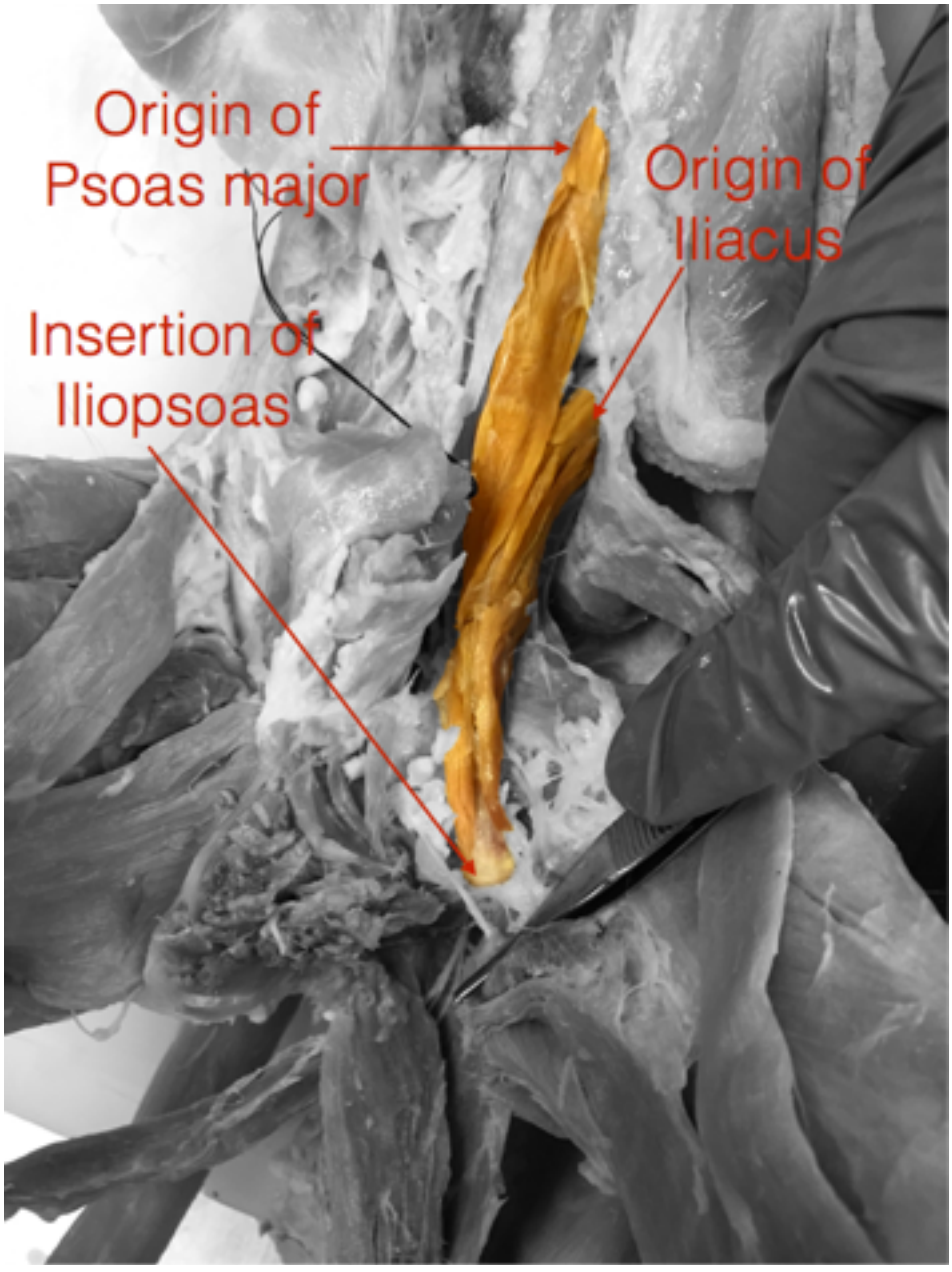

Figure 38: Iliopsoas m. (left; anterior view; rectus abdominis m., external and internal oblique mm. reflected laterally)

Psoas minor

This muscle is functionally similar in humans and *Macaca* although its origin differs: rhesus macaque- L1-L4; human- T12-L1 (Howell and Straus, 1933). It inserts on the iliopubic junction (Figure 39).

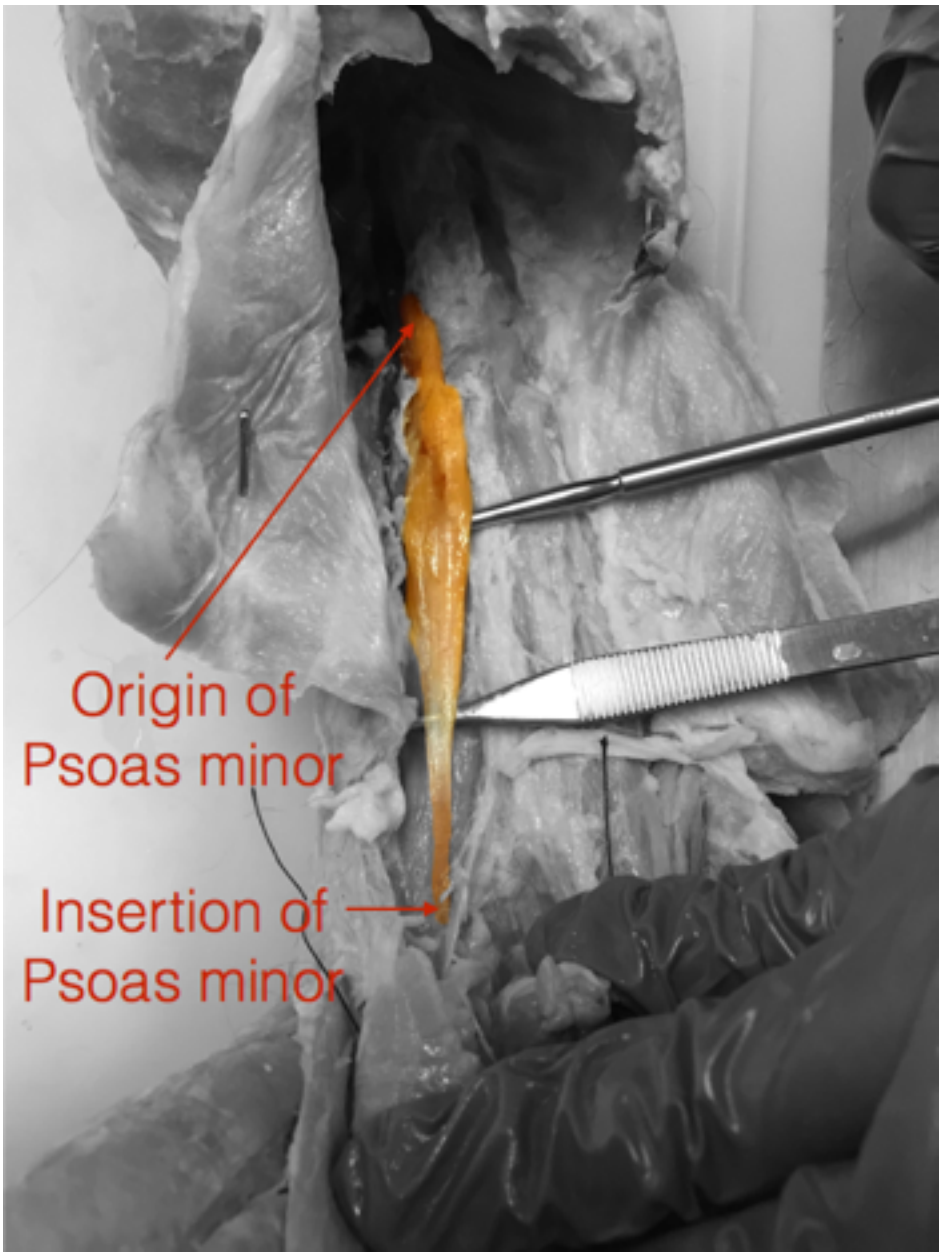

Figure 39: Psoas minor m. (right; anterior view; rectus abdominis m., external and internal oblique mm. reflected laterally)

Gluteus maximus

This muscle originates from lateral portions of the sacrum and ilium and attaches to the gluteal tuberosity of the femur and merges laterally with the tensor fascia latae (Figure 40). In humans, the gluteus maximus functions to abduct the hip as well as extend the hip and knee. In the macaque, the gluteus maximus functions primarily to abduct the hip (Swindler and Wood, 1973).

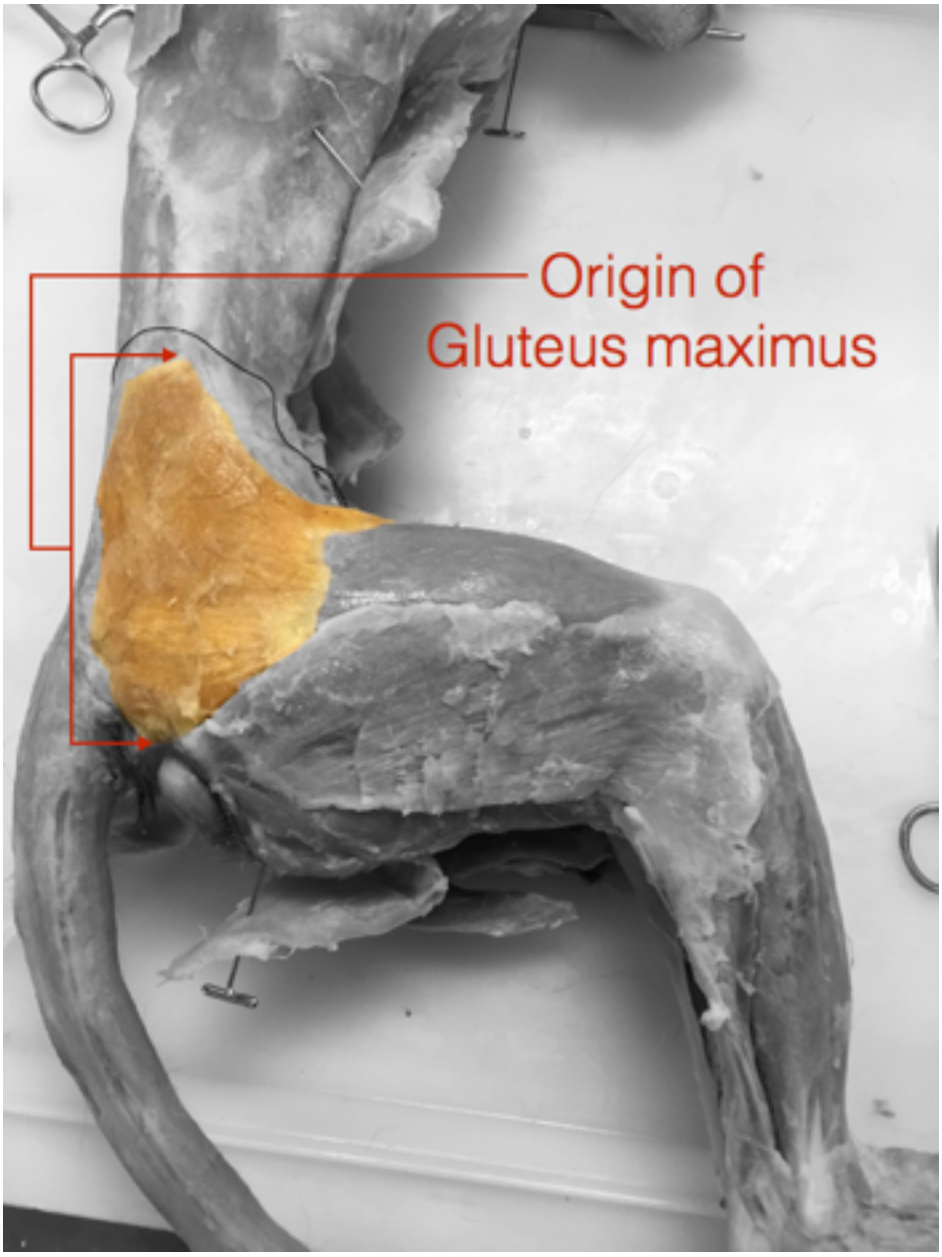

Figure 40: Gluteus maximus m. (right; lateral view; iliotibial tract removed)

Gluteus medius

Gluteus medius lies deep to gluteus maximus and is functionally similar in both *Macaca* and humans. In the rhesus macaque, this muscle originates from the lateral border of the sacrum and posterior aspect of the ilium (Figure 41). It attaches to the greater trochanter of the femur.

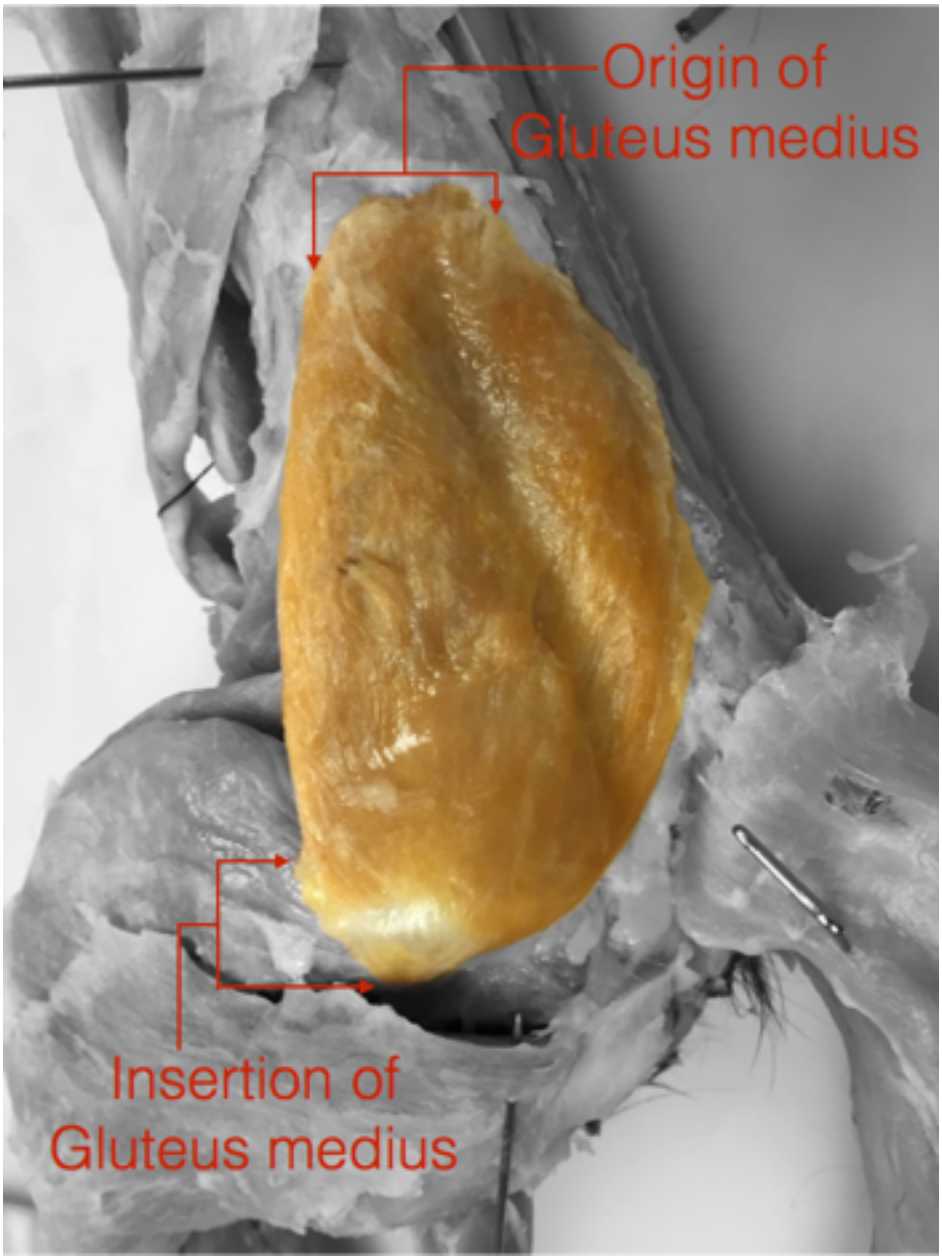

Figure 41: Gluteus medius m. (left; lateral view; gluteus maximus m. reflected infero-dorsally)

Gluteus minimus

This muscle lies deep to gluteus medius, originates from the inferoposterior aspect of the ilium, and attaches to the superior portion of the greater trochanter of the femur (Figure 42). It does not differ significantly between humans and macaque.

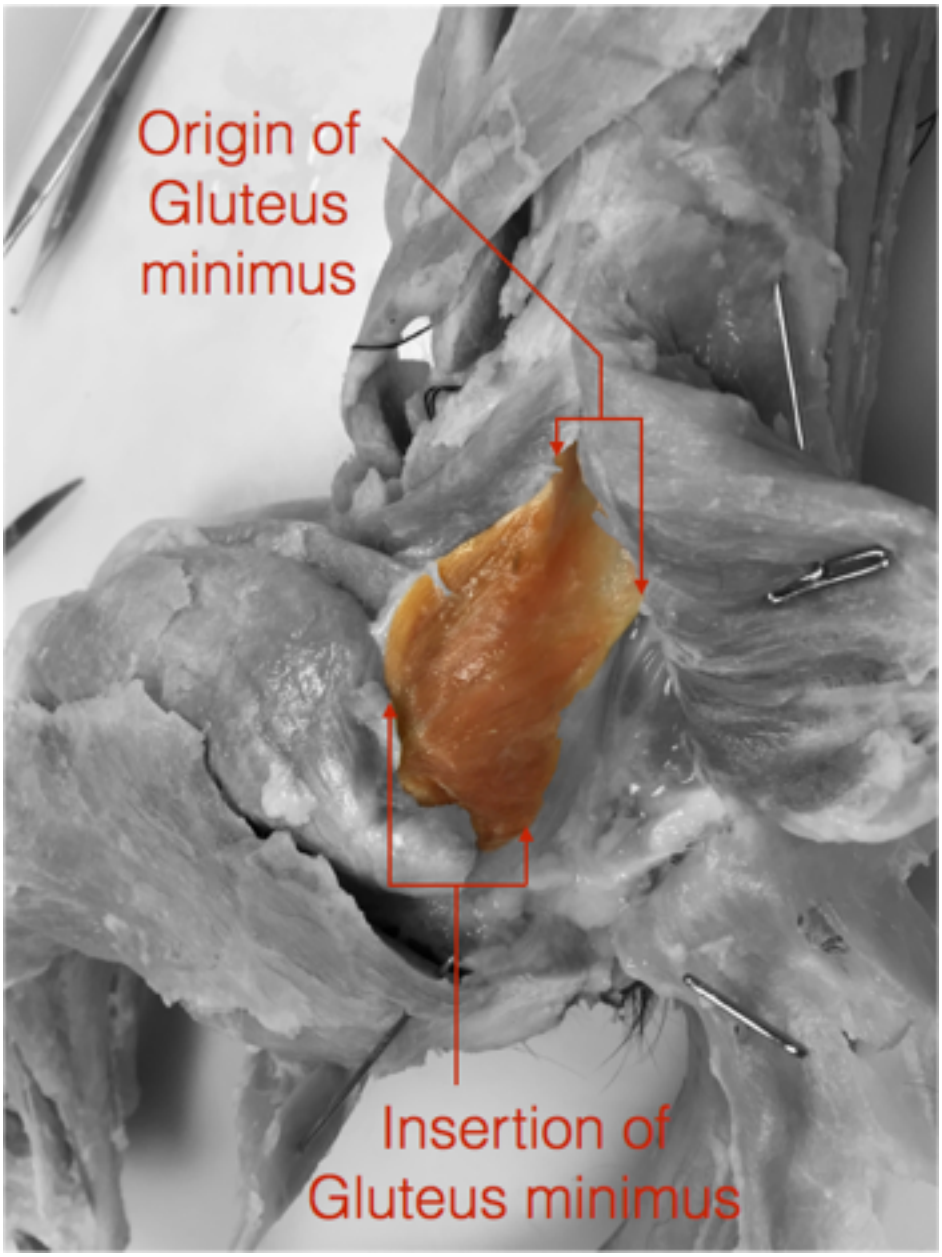

Figure 42: Gluteus minimus m. (left; lateral view; gluteus maximus m. reflected infer-dorsally; gluteus medius m. reflected dorsally)

Piriformis

Piriformis originates from the inferolateral portion of the sacrum and inserts onto the medial portion of the greater trochanter (Figure 43). This configuration is similar to that in humans.

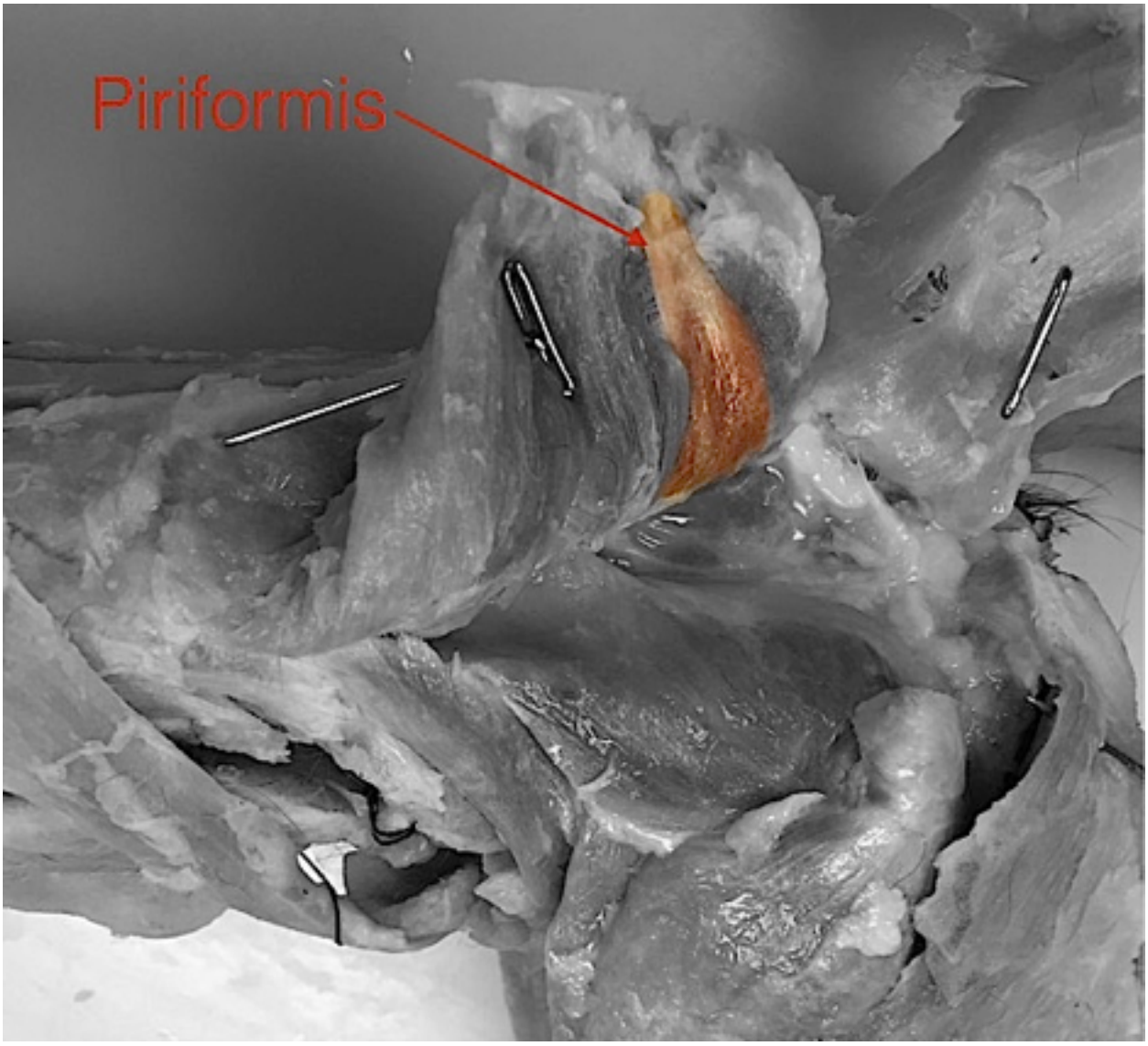

Figure 43: Piriformis m. (left; dorso-lateral view; gluteus maximus m. reflected infero-dorsally; gluteus medius m. reflected superio-dorsally; piriformis m. has been cut at the distal end and reflected with gluteus medius m.)

Obturator internus

The origin is from the ischiopubic junction and obturator membrane. It inserts on the inferior most medial portion of the greater trochanter of the femur (Figure 44; Howell and Straus, 1933). This muscle if functionally similar in humans and macaques.

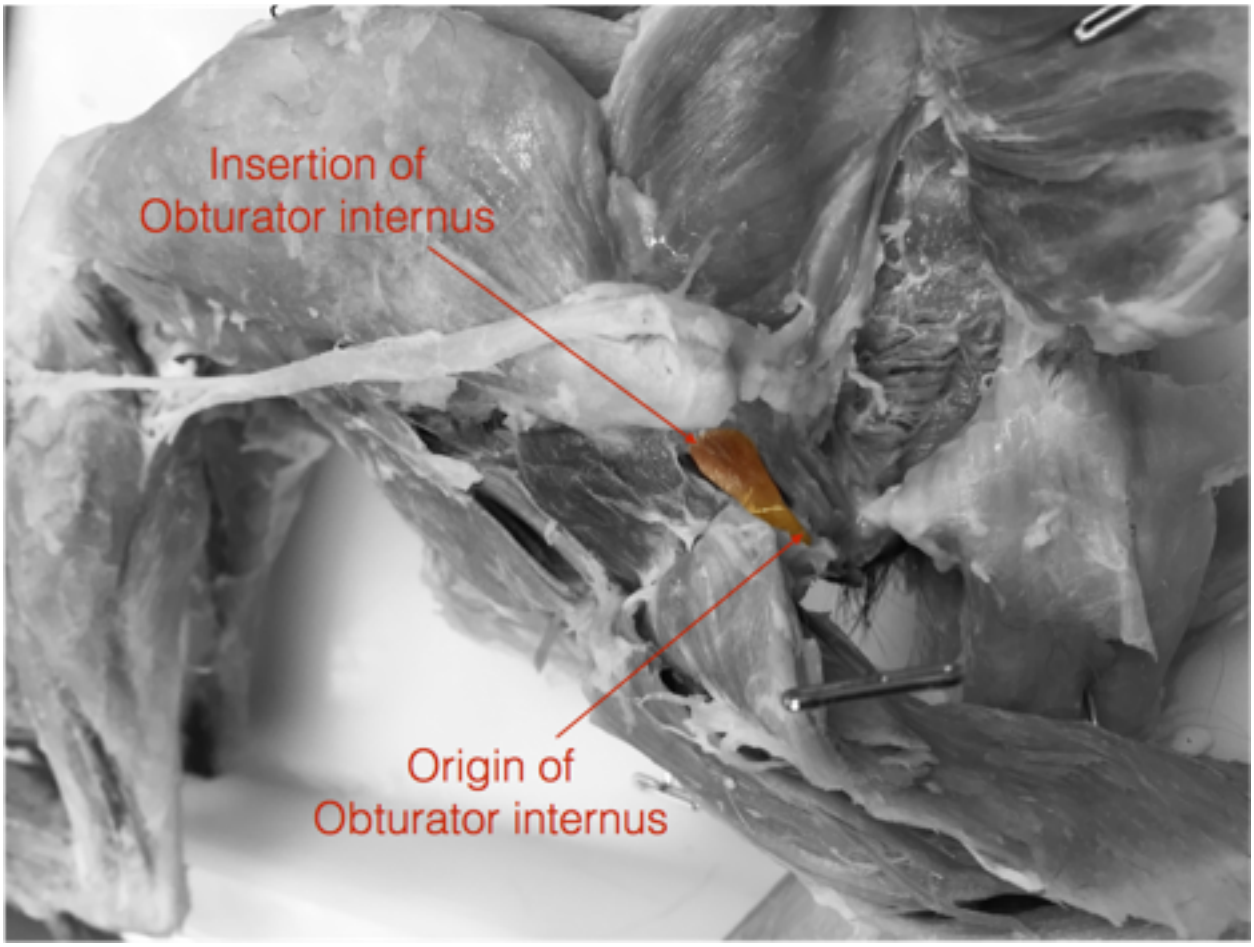

Figure 44: Obturator internus m. (left; lateral view; gluteus maximus m. reflected infer-dorsally; gluteus medius m. reflected dorsally)

Superior and inferior gemelli

The orientation and differentiation in the gemelli muscles are highly variable among different primate species. Howell and Straus (1933) describe the gemelli as one undifferentiated muscle in *Macaca mulatta*, but that configuration is not consistent with our specimen. As in humans, our *Macaca fascicularis* specimen has both superior and inferior gemelli muscles although their orientation is unlike that in humans--where obturator internus lies between the two gemelli. In the macaque (figure 45), the two gemelli appear side by side and a portion of their muscle bellies are covered by the tendon of obturator internus. The gemelli originate from the ischial tuberosity and insert on the obturator internus tendon.

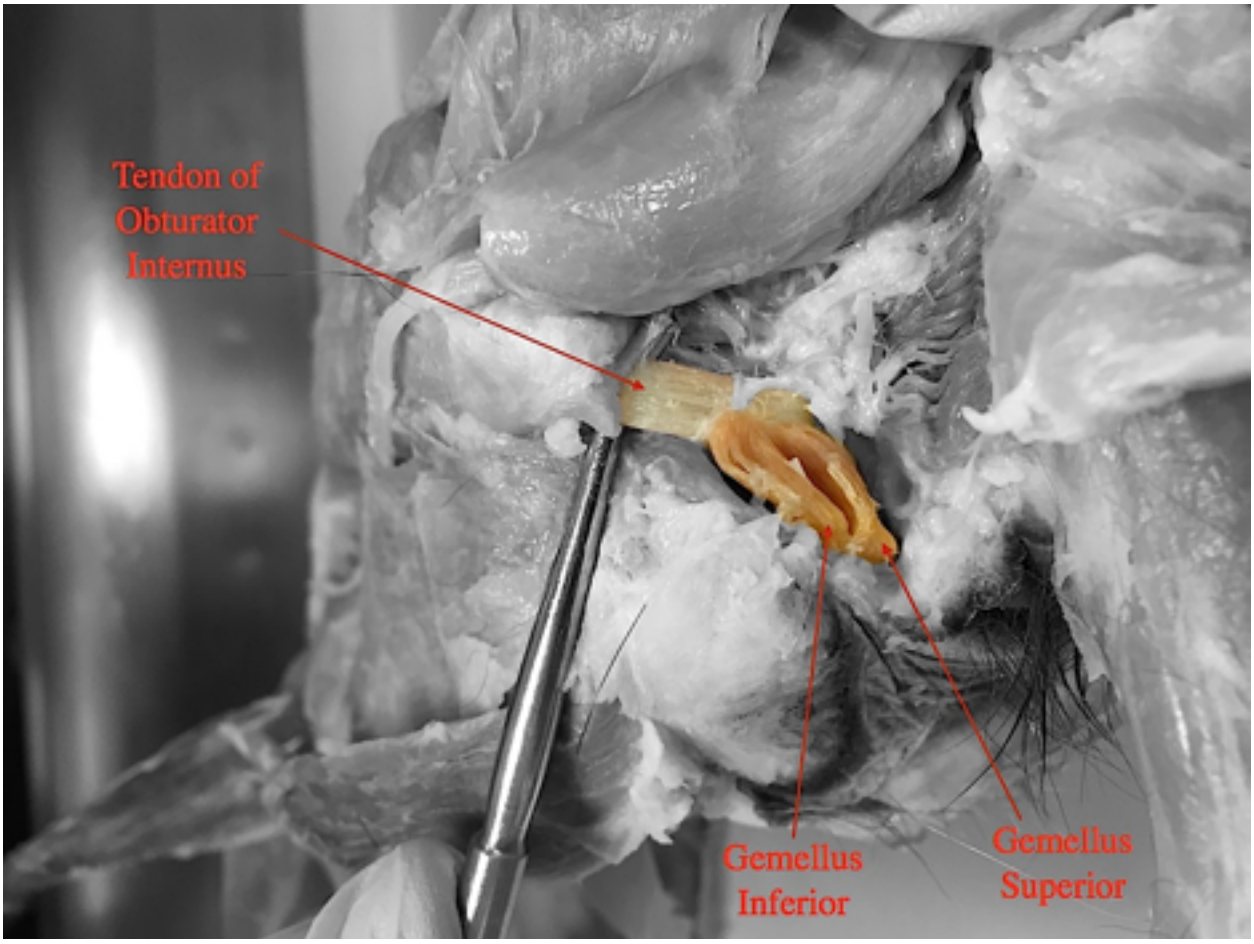

Figure 45: Superior and inferior gemelli mm. (left; latero-dorsal view; gluteus maximus m. reflected infer-dorsally; gluteus medius m. reflected dorsally)

Quadratus femoris

This muscle is functionally similar in humans and Macaca. It originates from the ischial tuberosity and attaches to the lesser trochanter and intertrochanteric crest of the femur (Figure 46).

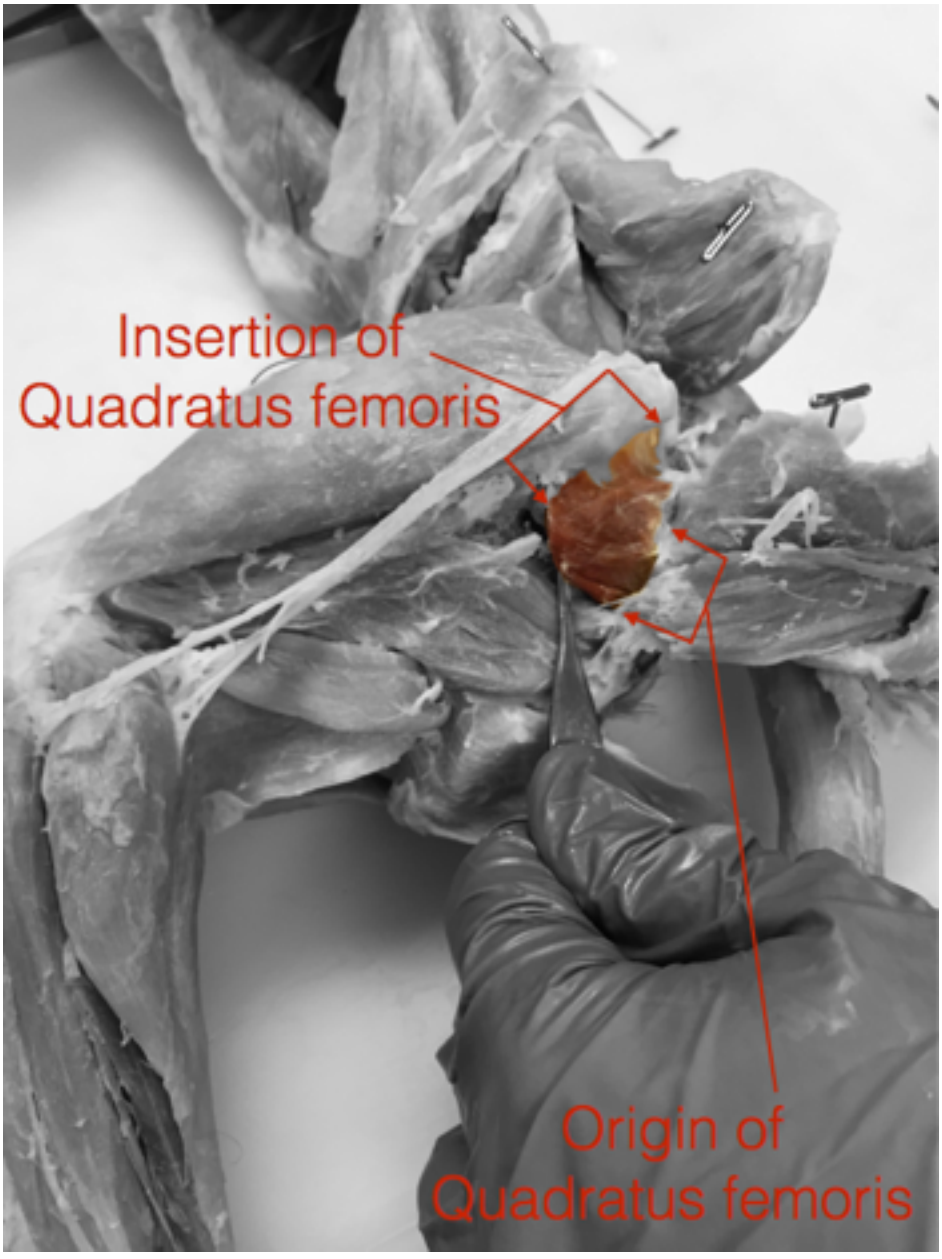

Figure 46: Quadratus femoris m. (left; lateral view; biceps femoris m. reflected superio-dorsally)

Muscles of the Thigh

Flexors

Biceps femoris

In *Macaca*, this muscle is not actually bicipital and consists of only one head--analogous to the long head in humans. It originates from the ischial tuberosity and attaches to the lateral thigh via tensor fascia latae and the superior half of the lateral leg on the proximal tibia (Figure 47).

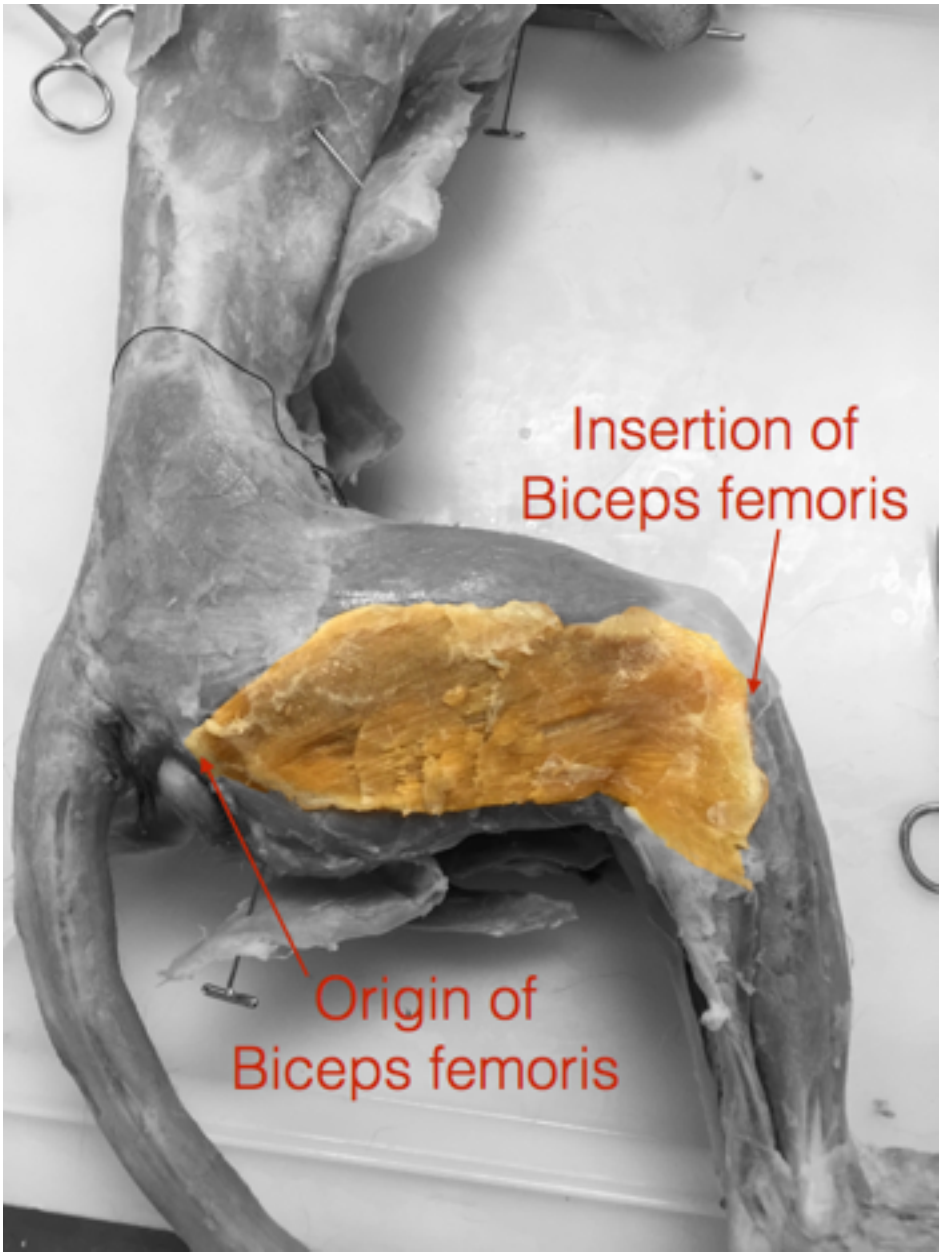

Figure 47: Biceps femoris m. (right; lateral view; iliotibial tract removed)

Semitendinosus

This muscle, similar in humans and macaques, has its origin on the ischial tuberosity and attaches to the pes anserinus of the tibia (Figure 48A,B).

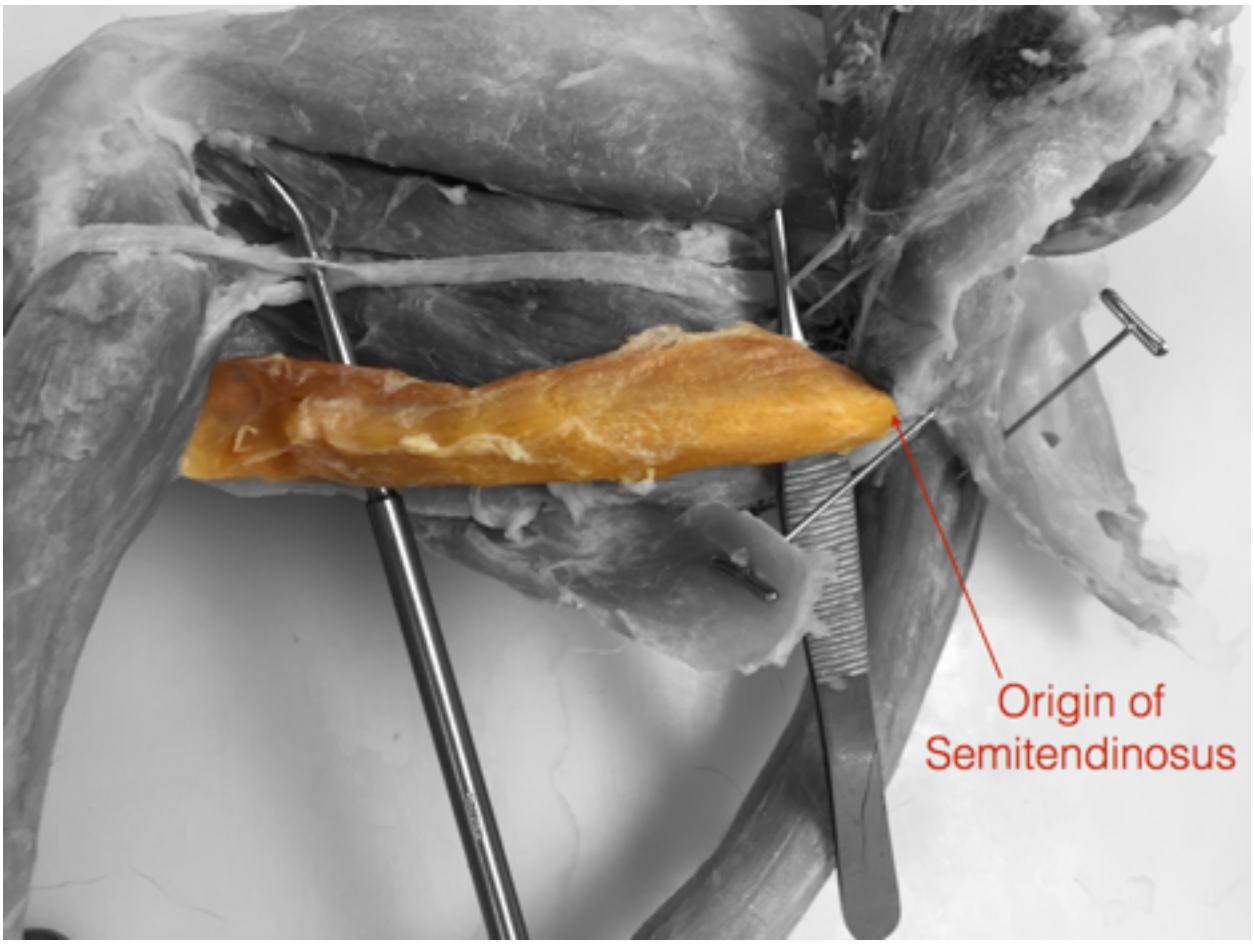

Figure 48A: Semitendinosus m. (left; lateral view; biceps femoris m. reflected superio-dorsally)

Figure 48B: Semitendinosus m. (left; medial view; semimembranosus prepress m. reflected superiorly)

Semimembranosus proprius

Semimembranosus is composed of two distinct muscles in *Macaca*: semimembranosus proprius and semimembranosus accessories. Semimembranosus proprius originates from the lateral portion of the ischial tuberosity (Figure 49A) and attaches to medial portion of the tibial tuberosity (Figures 49B).

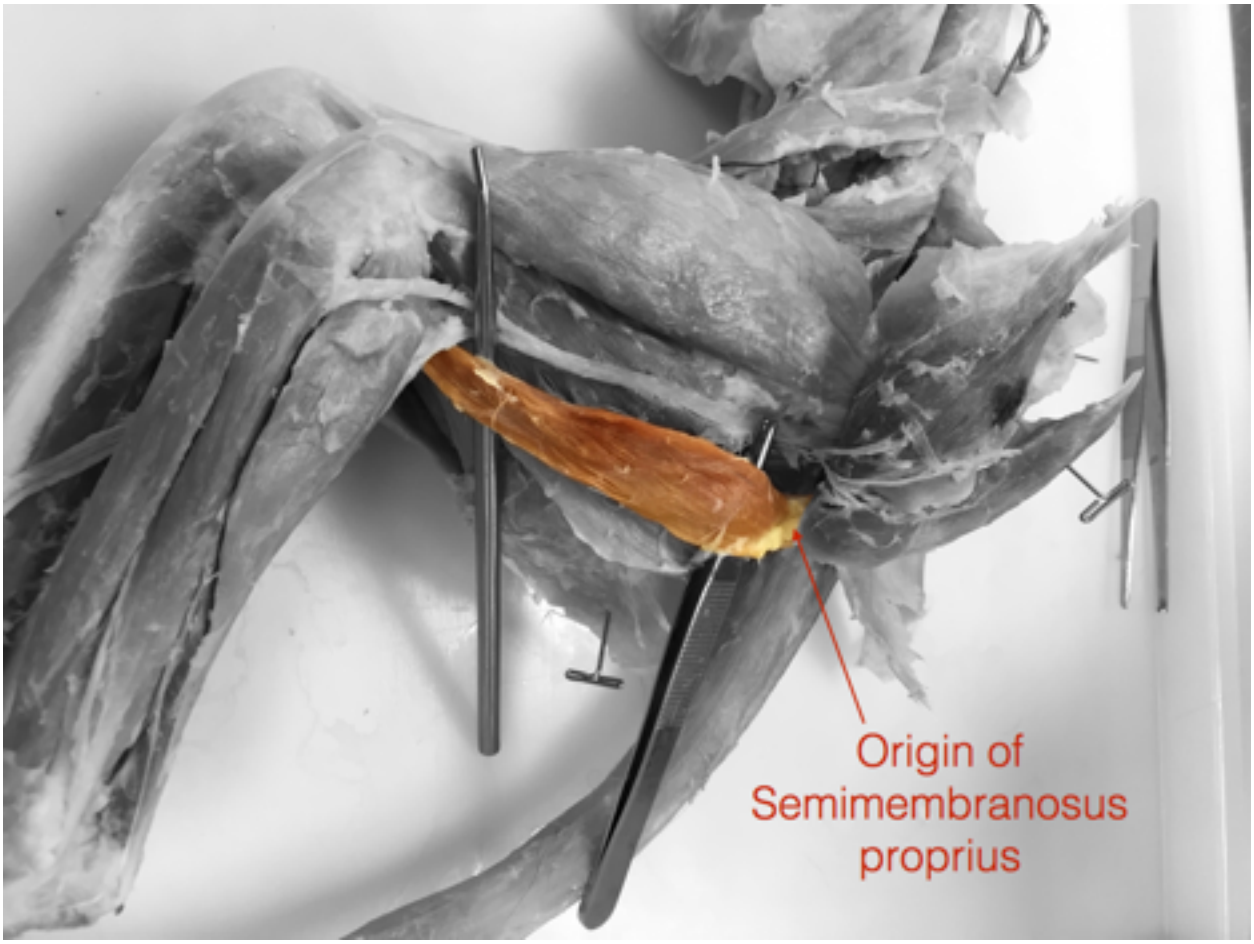

Figure 49A: Semimembranosus proprius m. (left; lateral view; biceps femoris m. reflected superio-dorsally)

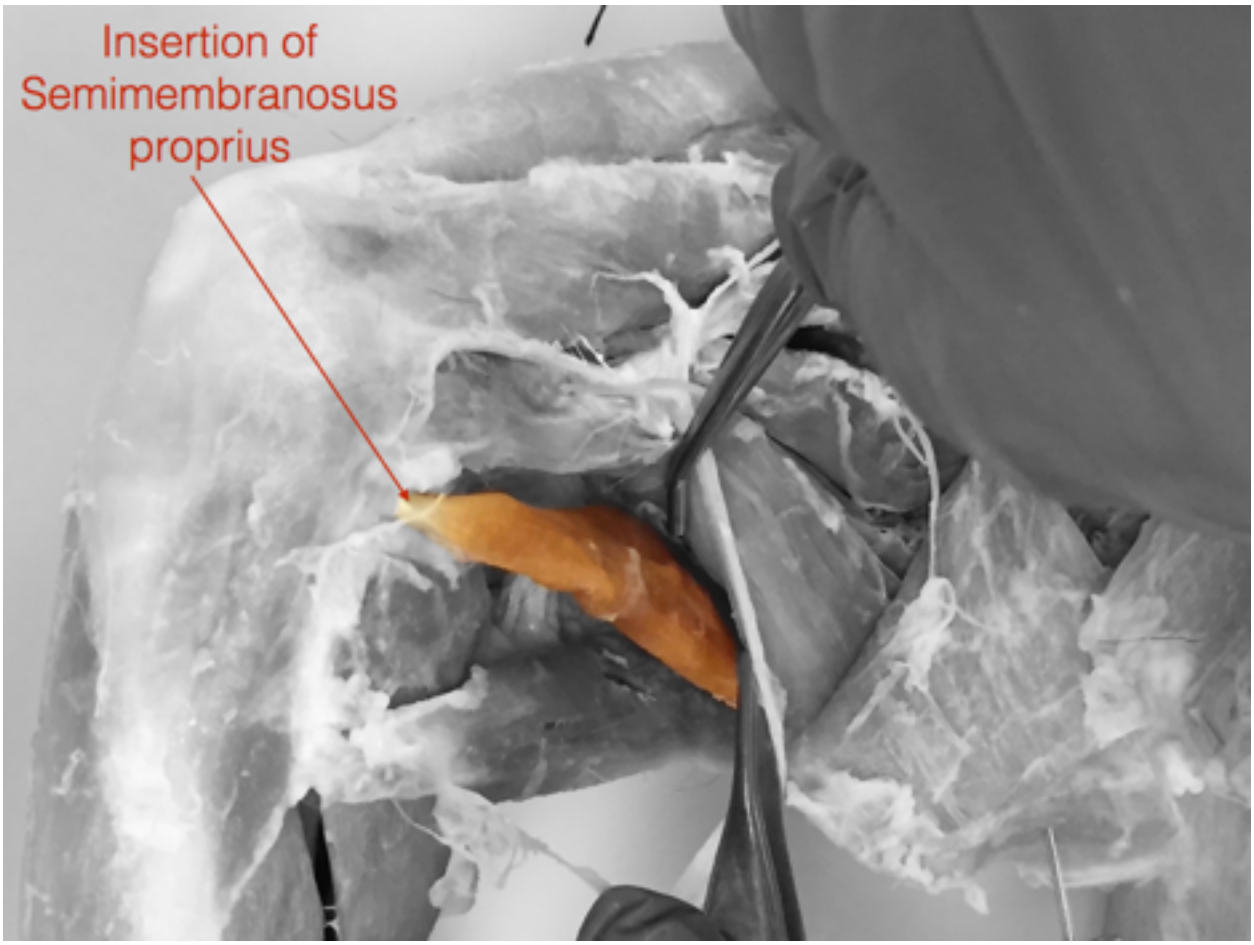

Figure 49B: Semimembranosus proprius m. (right; medial view; gracilis m. reflected infero-medially; sartorius m. reflected superio-medially)

Semimembranosus accersorius

This muscles has its origin on ischial tuberosity (Figure 50A) and attaches to the medial shaft of the femur and the medial condyle of the femur (Figure 50B).

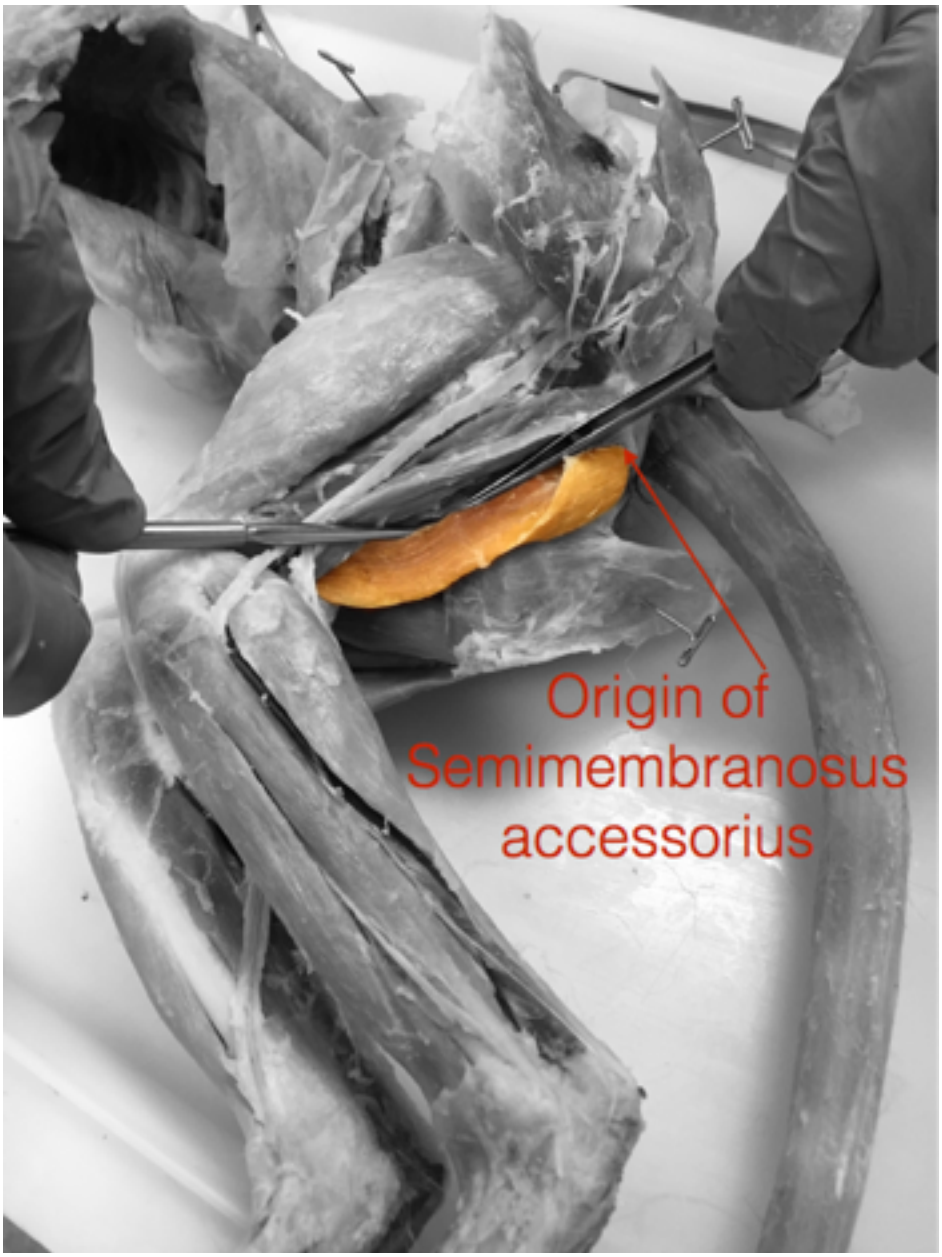

Figure 50A: Semimembranosus accessorius m. (left; lateral view; biceps femoris m. reflected superio-dorsally)

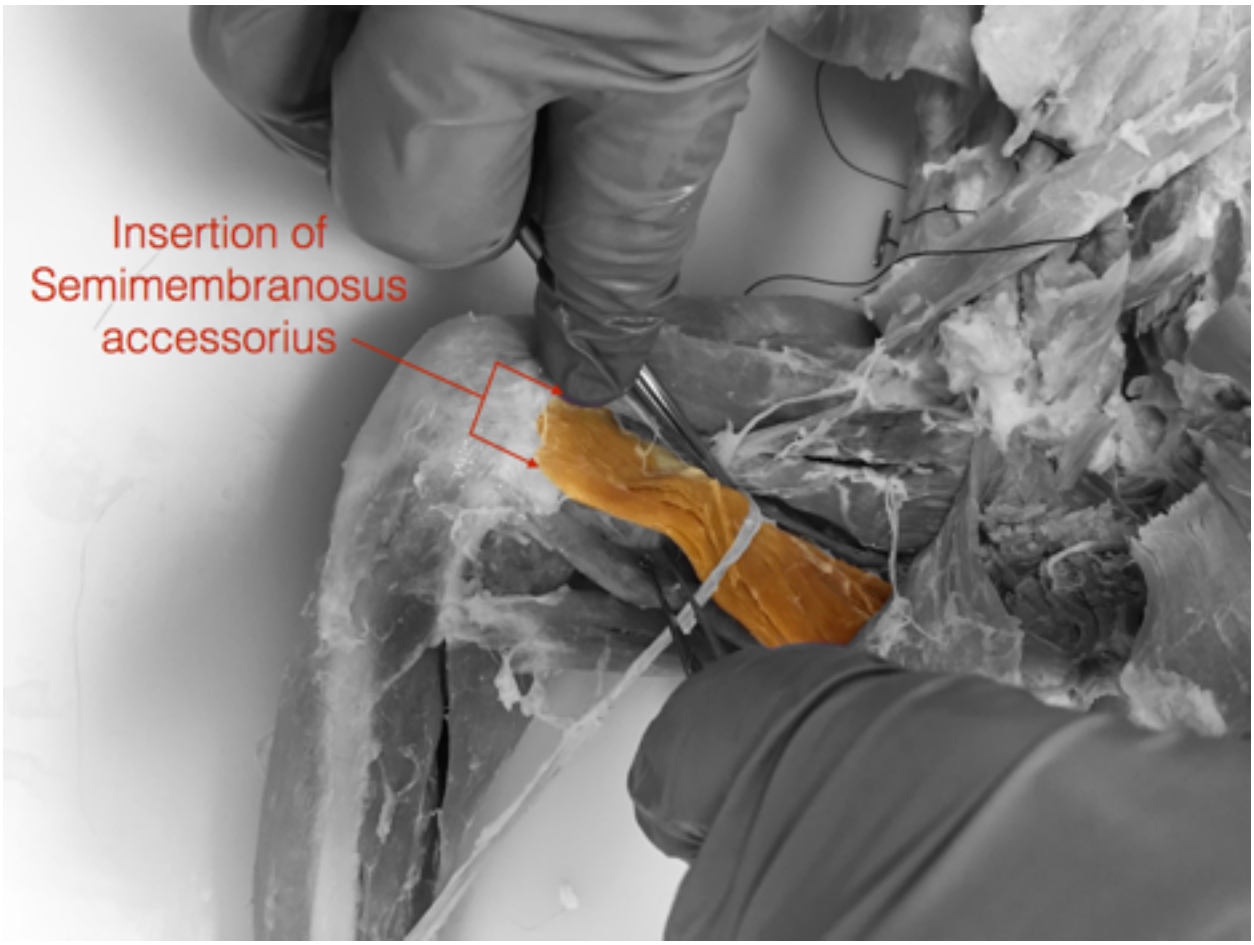

Figure 50B: Semimembranosus accessorius m. (right; medial view; gracilis m. reflected infero-medially; sartorius m. reflected superio-medially)

Adductors

Gracilis

This muscle originates from the ischiopubic ramus just lateral to the pubic symphysis and attaches to the pes anserinus of the tibia (Figure 51). This muscles functions similarly in humans and macaques although it is proportionately larger in the macaque.

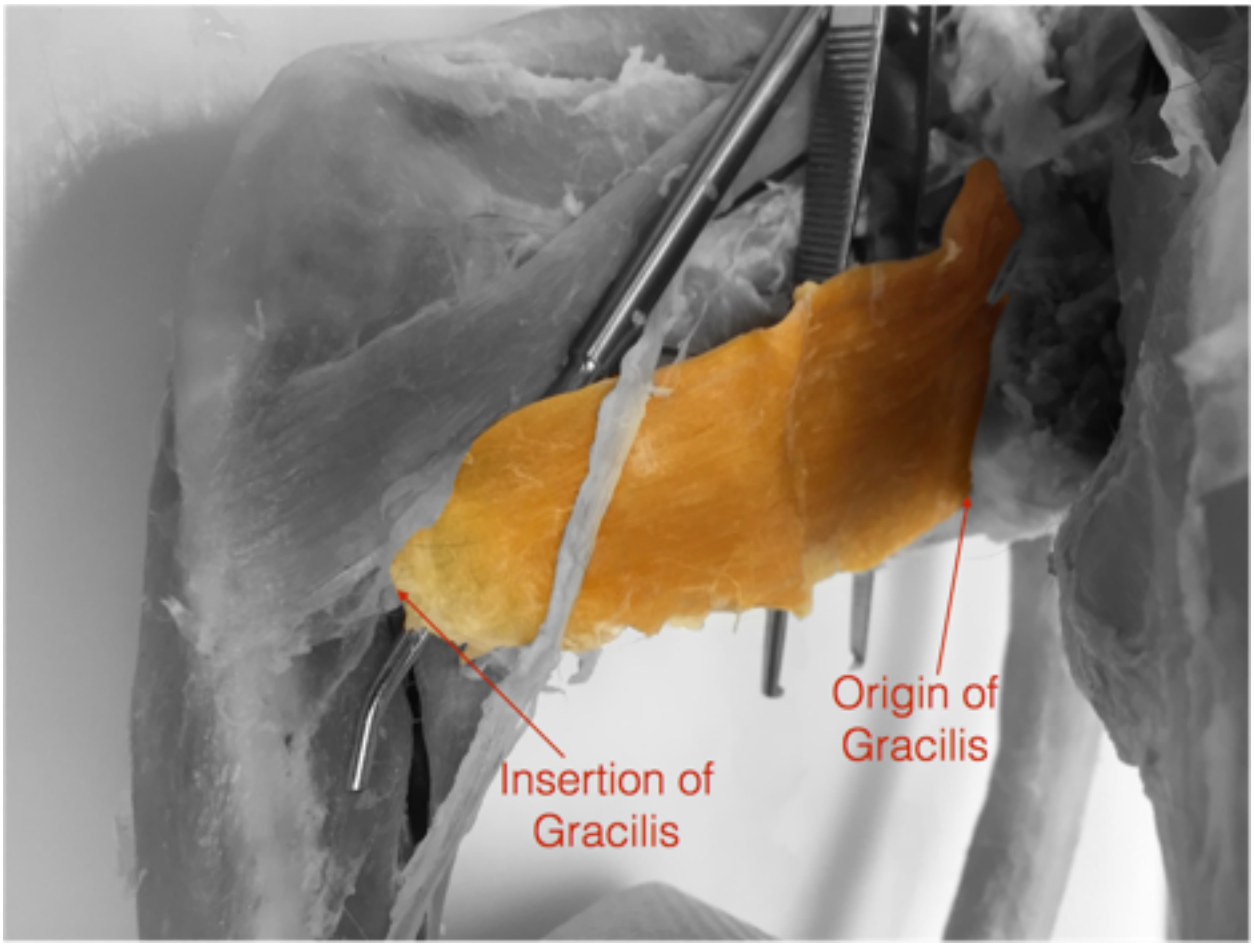

Figure 51: Gracilis m. (right; medial view)

Adductor longus

In humans and macaques this muscle originates from the superior portion of the ischiopubic ramus just lateral to the pubic symphysis and attaches to a large portion of the linea aspera of the femur (Figure 52).

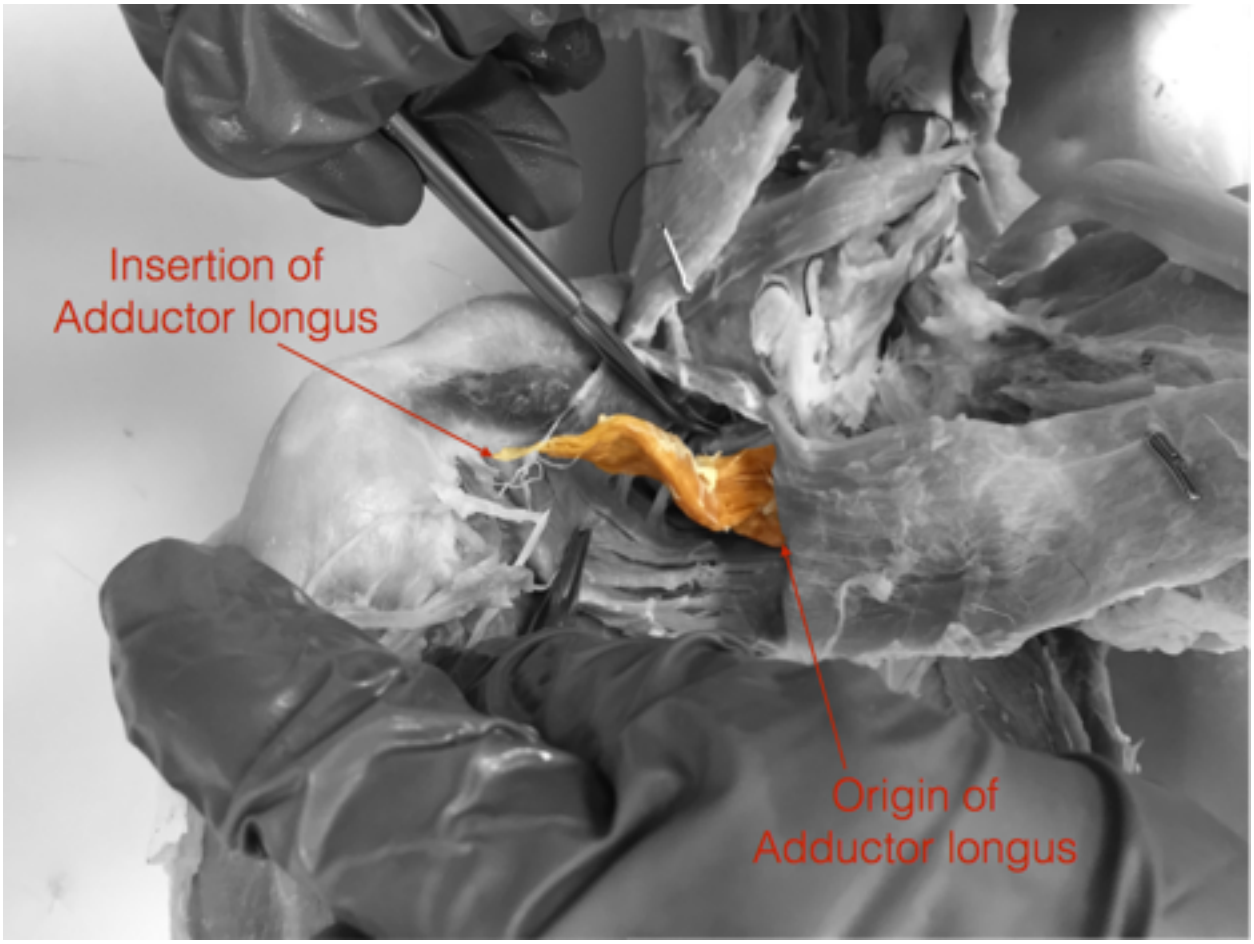

Figure 52: Adductor longus m. (right; medial view; gracilis m. reflected infero-medially; sartorius m. reflected superio-medially; semimembranosus accessorius reflected inferiorly)

Pectineus

This muscle has an origin from the superior portion of the pubic bone just above the obturator foramen. It attaches to the proximal third of the linear aspera of the femur (Figure 53). This configuration is similar in humans and *Macaca*.

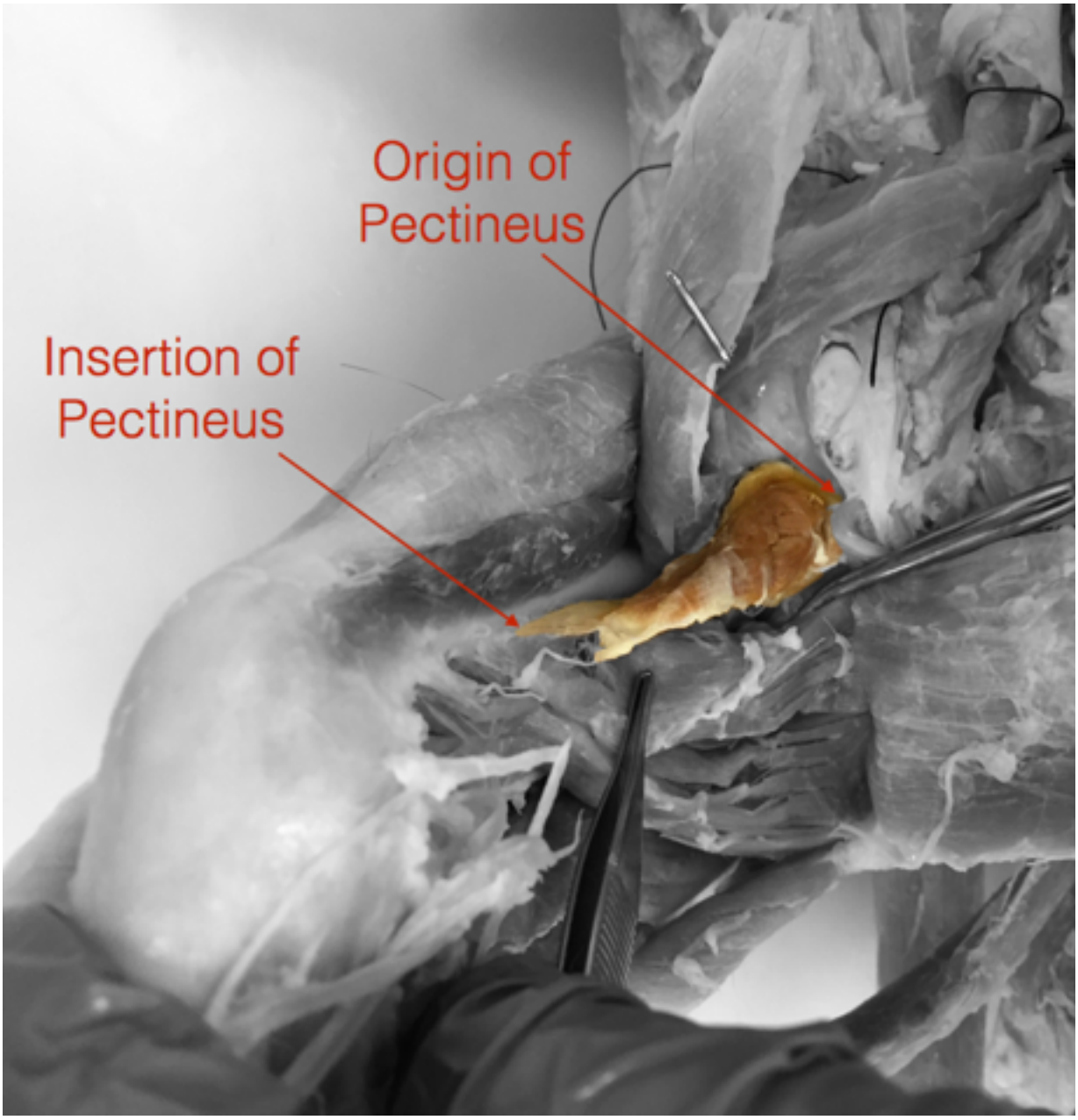

Figure 53: Pectineus m. (right; medial view; gracilis m. reflected infer-medially; sartorius m. reflected superio-medially)

Adductor brevis

This muscle originates from the superior portion of the pubic bone deep to adductor magnus (Figure 54). In our macaque specimen the muscle attached to the proximal portion of the linea aspera. In humans, adductor brevis generally has a more proximal attachment on and/or just below the lesser trochanter of the femur.

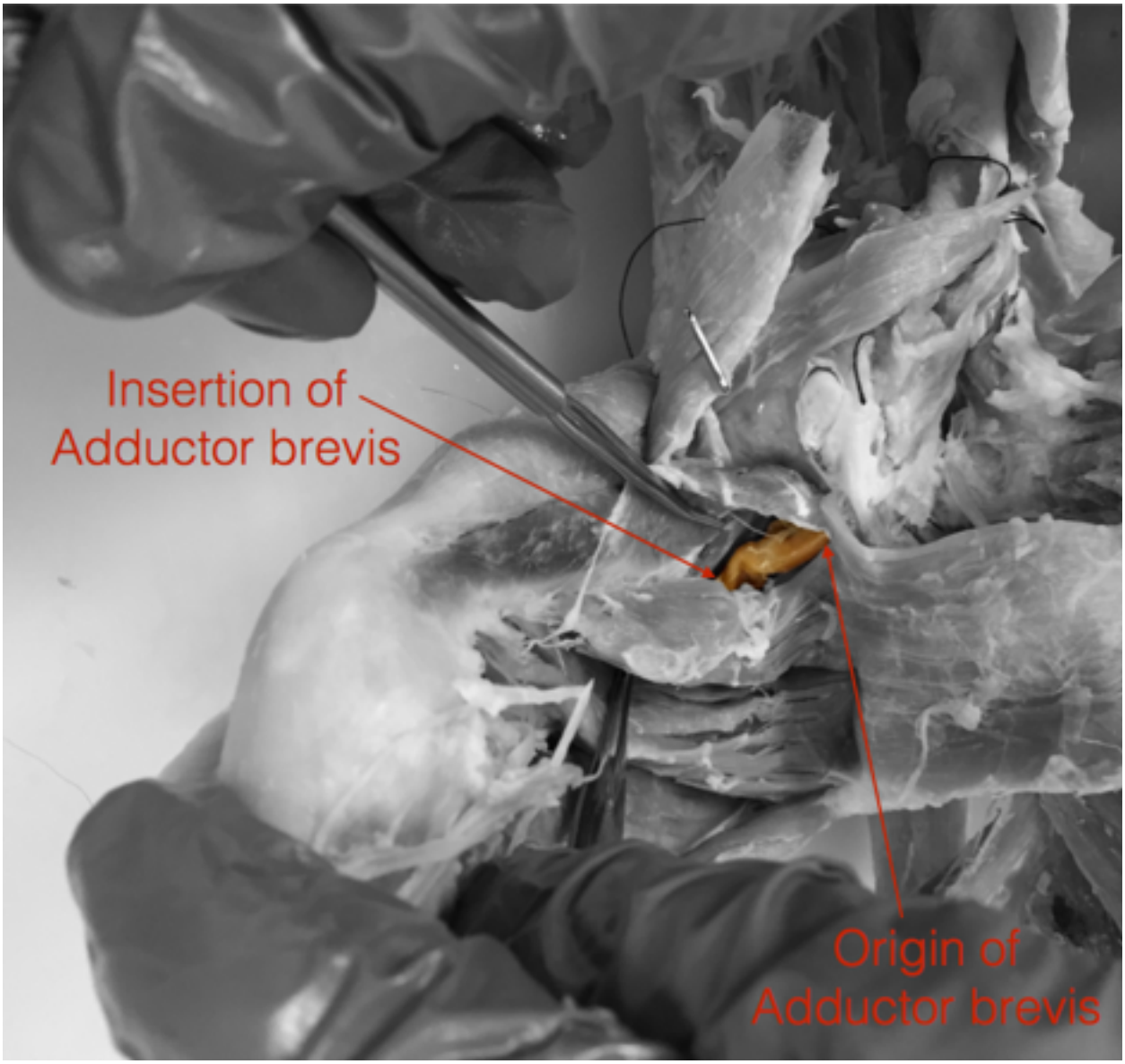

Figure 54: Adductor brevis m. (right; medial view; gracilis m. reflected infero-medially; sartorius m. reflected superio-medially; adductor longus reflected superiorly)

Adductor magnus

This muscle has two distinct portions: an anterior belly and a posterior belly. Both divisions arise from the ischial tuberosity and pubic bone. The anterior portion attaches to the distal portion of the linear aspera of the femur while the posterior portion attaches to the middle third of the linea aspera of the femur (Figure 55). Adductor magnus in humans is configured slightly differently as it also attaches to the medial condyle of the femur. This is the result of the semimembranosus accessorius m. being incorporated into the adductor magnus in humans.

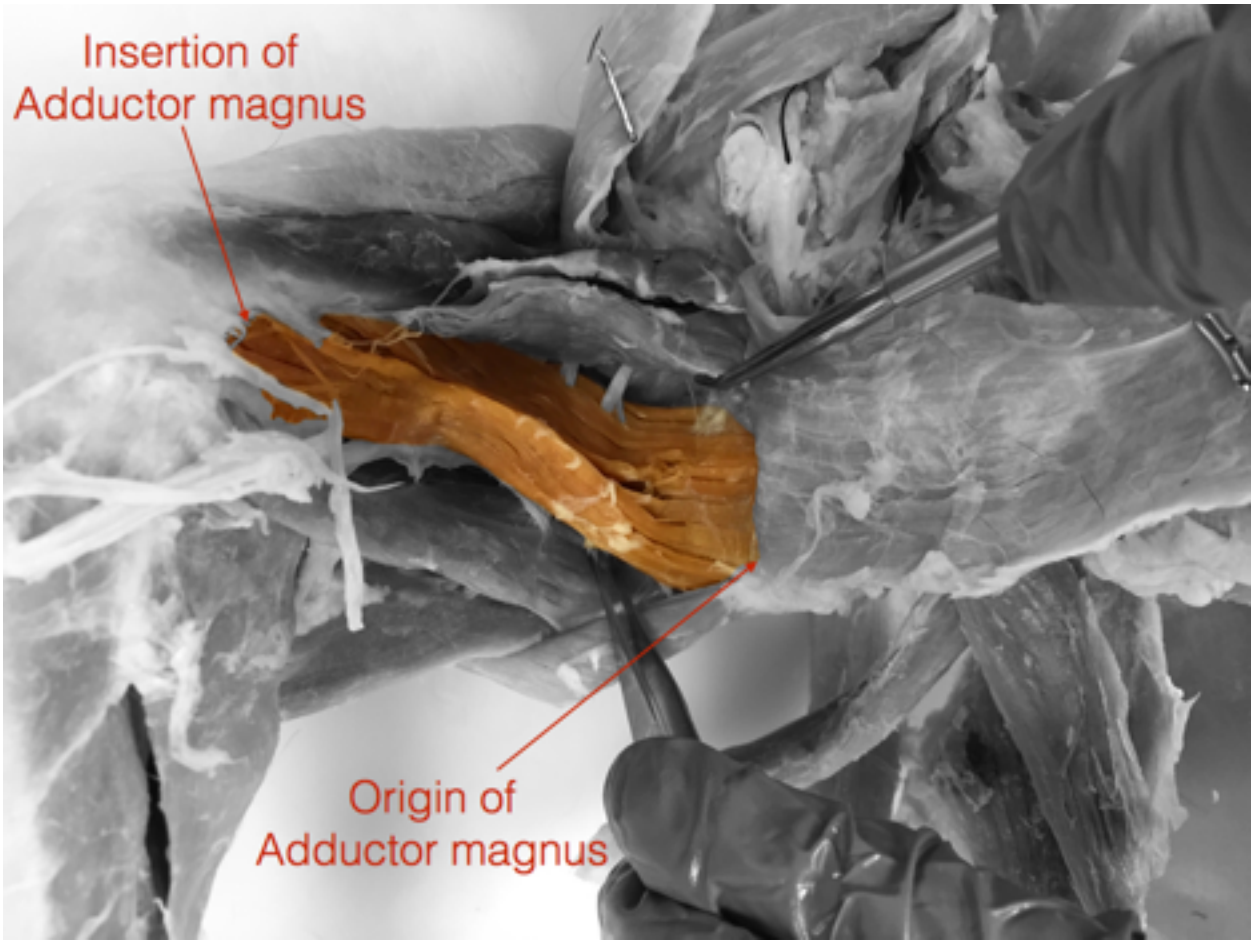

Figure 55: Adductor magnus m. (right; medial view; gracilis m. reflected infero-medially; sartorius m. reflected superio-medially; semimembranosus accessorius reflected inferiorly)

Obturator externus

In humans and *Macaca*, this muscle arises from the lateral border of the obturator foramen and obturator membrane and attaches to the intertrochanteric fossa of the femur (Figure 56).

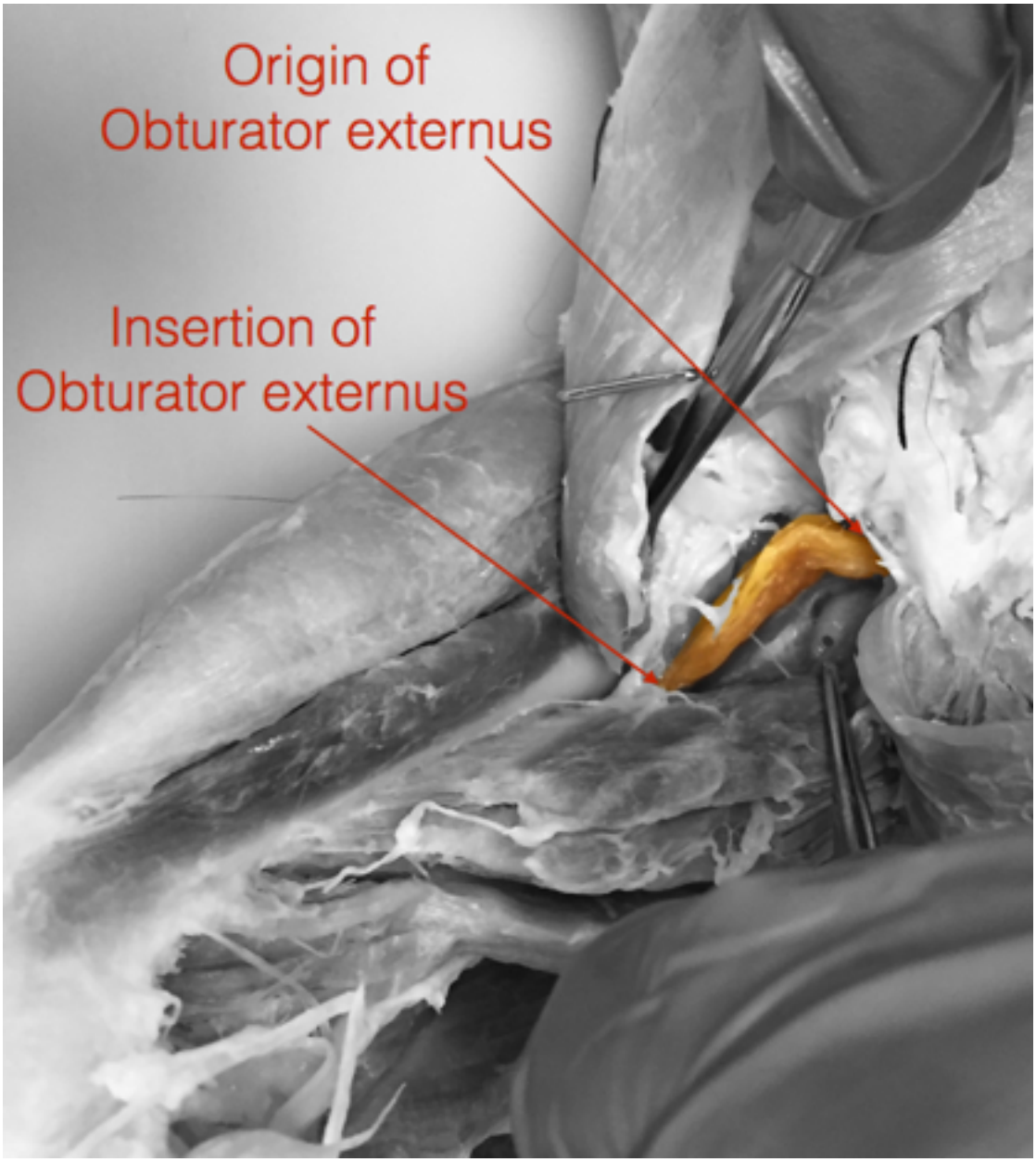

Figure 56: Obturator externus m. (right; medial view; gracilis m. reflected infero-medially; sartorius m. reflected superio-medially; pectineus m reflected superiorly)

Extensors

Sartorius

This muscle originates on the inferoanterior aspect of the ilium, runs inferomedially across the thigh, and attaches to the pes anserinus of the tibia (Figure 57). This muscle is functionally equivalent in humans and *Macaca*.

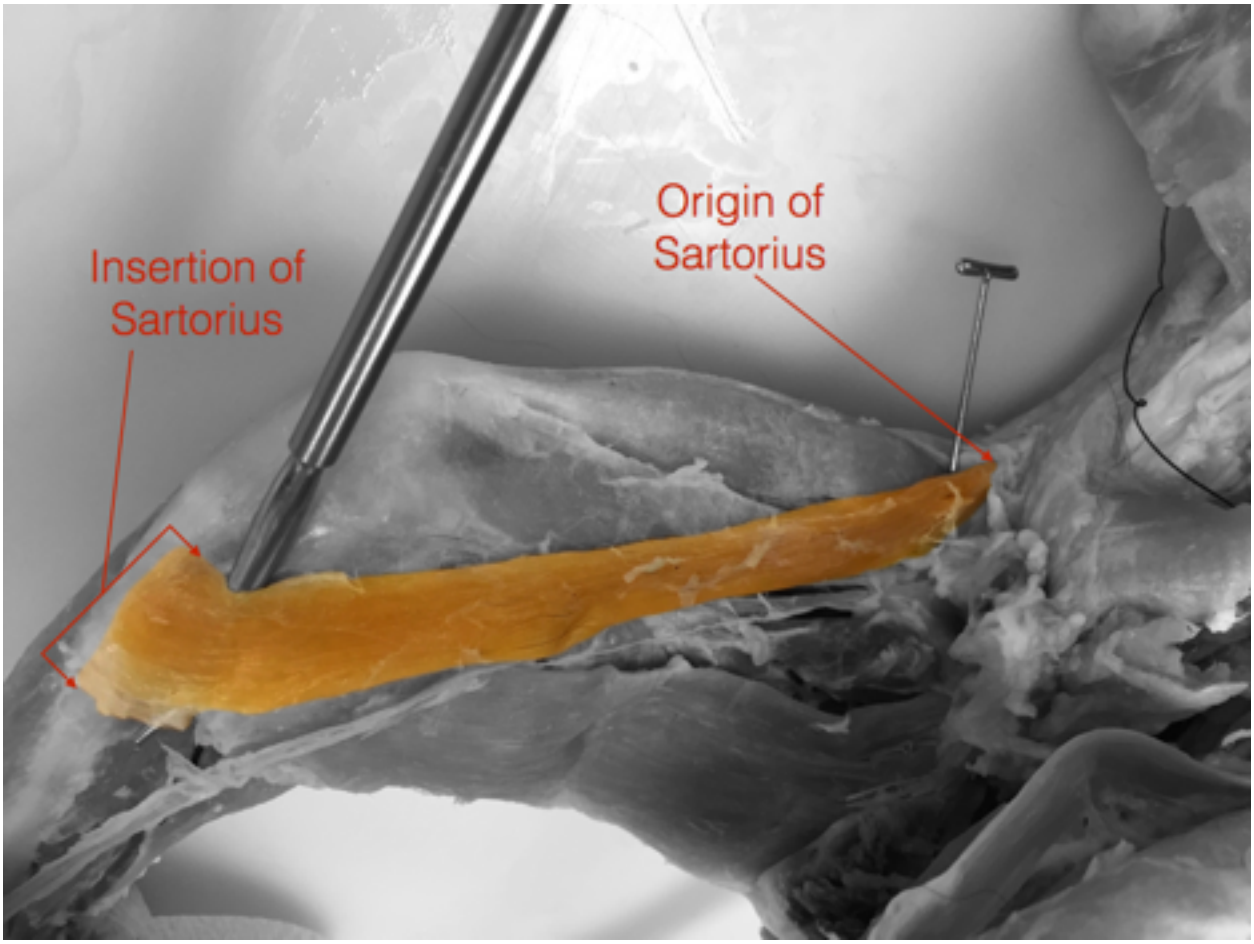

Figure 57: Sartorius m. (right; medial view)

Rectus femoris

In humans and macaques, rectus femoris arises from the anterior superior iliac spine on rectus femoris tubercle and attaches to the patellar tendon along with the three vasti muscles (Figure 58).

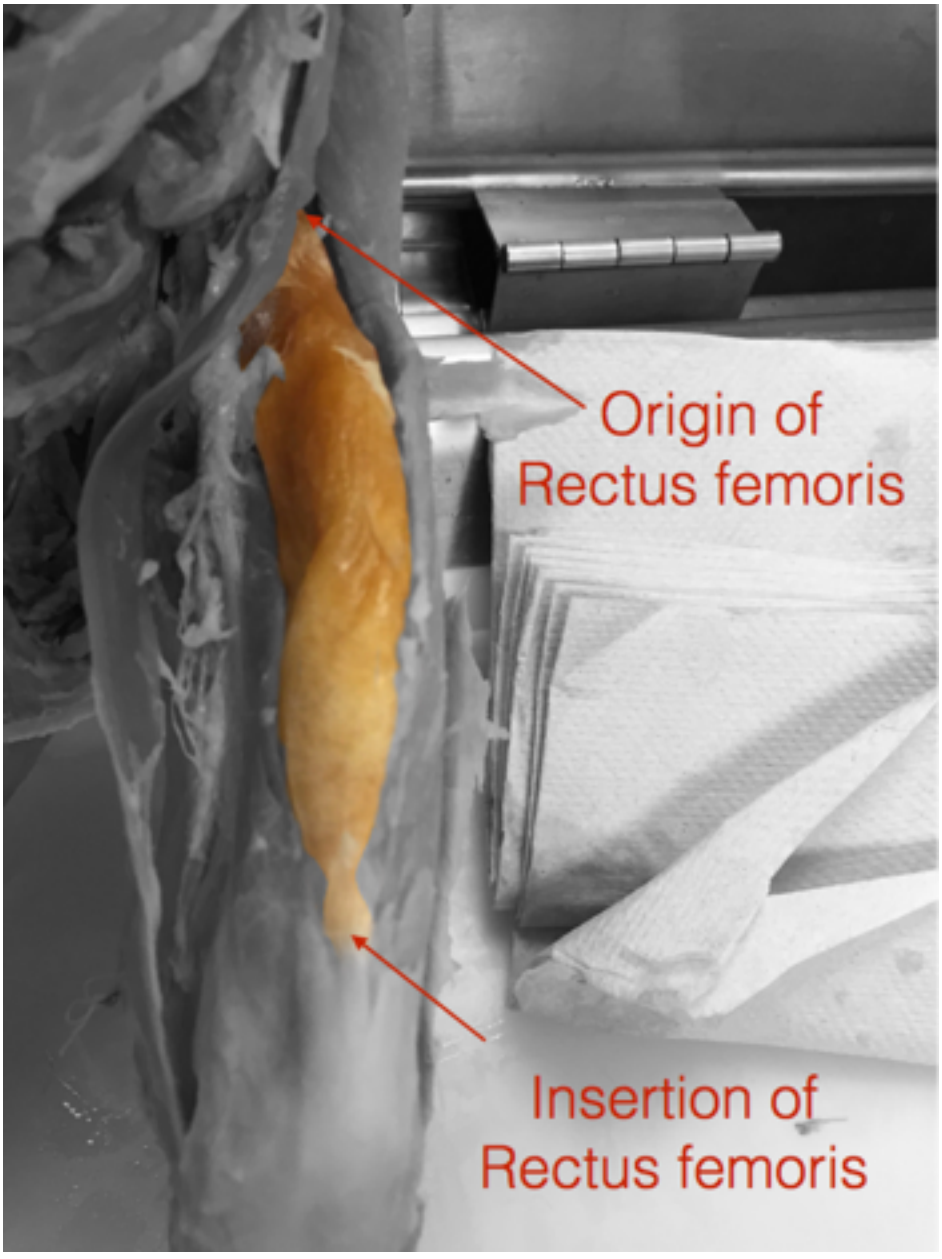

Figure 58: Rectus femoris m. (left; anterior view)

Vastus lateralis

This muscle is the largest of the three vasti muscles and originates from the lateral aspect of the greater trochanter of the femur. It inserts onto the patellar tendon along with rectus femoris, vastus medialis, and vastus intermedius (Figure 59). This configuration is similar in macaques and humans.

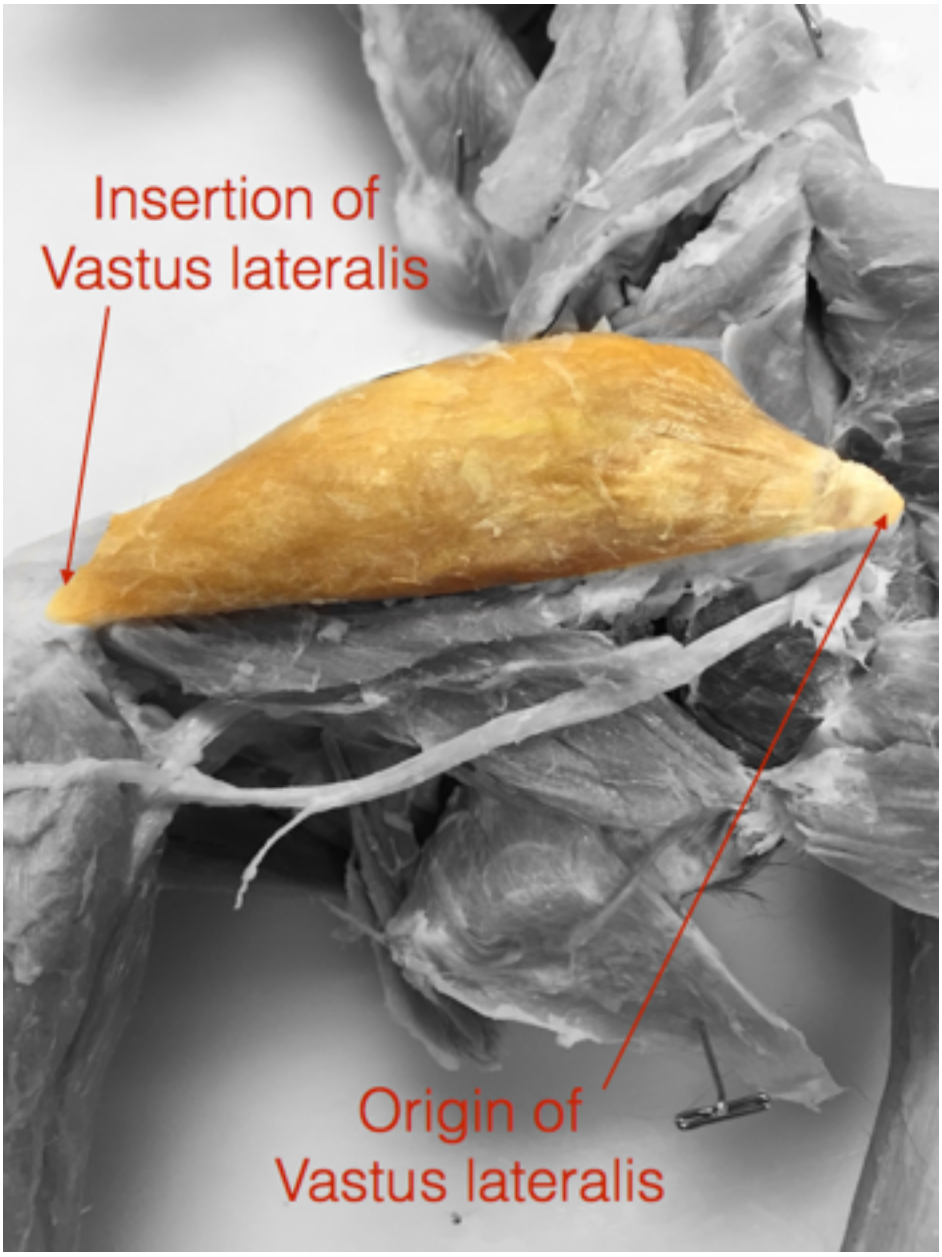

Figure 59: Vastus lateralis m. (left; lateral view; biceps femoris m. reflected superio-dorsally)

Vastus medialis

In both humans and *Macaca*, this muscle arises from the superomedial aspect of the linea aspera and lesser trochanter of the femur (Figure 60). It attaches to the common patellar tendon.

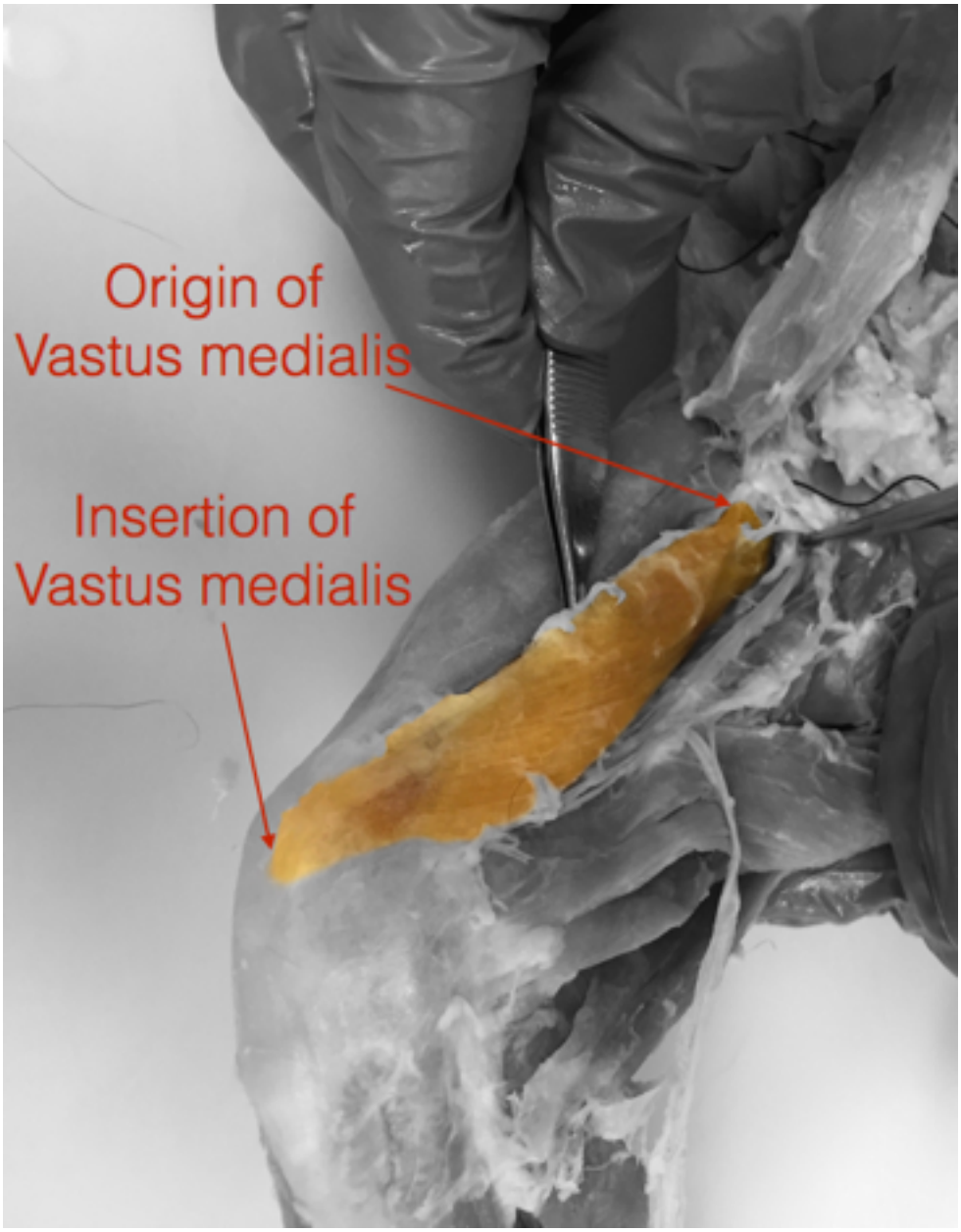

Figure 60: Vastus medialis m. (right; medial view; gracilis m. reflected infer-medially; sartorius m. reflected superio-medially)

Vastus intermedius

This muscle arises from most of the anterior aspect of the femoral shaft and appears deep to rectus femoris (Figure 61). It inserts on the common patellar tendon and is functionally similar in humans and *Macaca*.

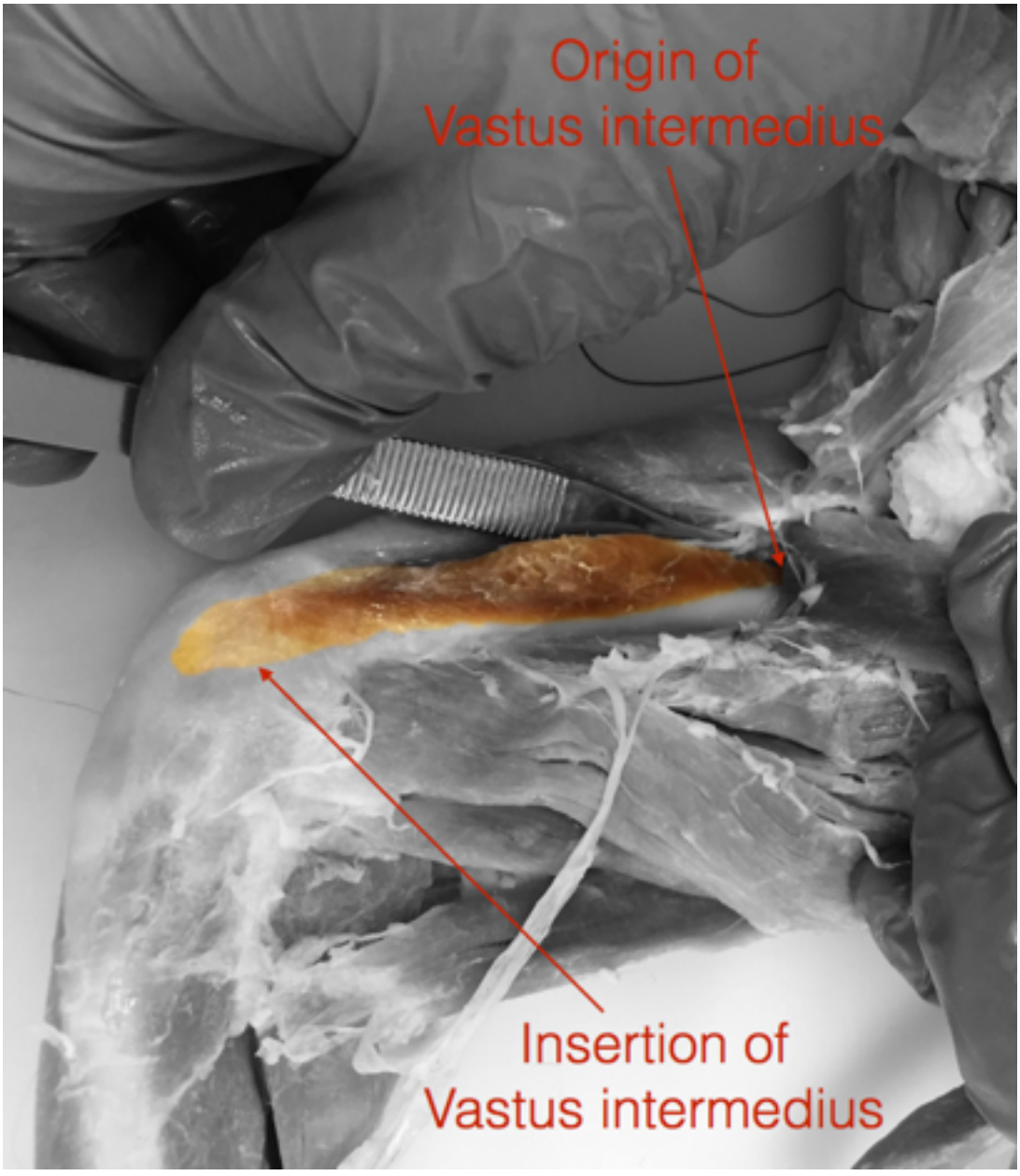

Figure 61: Vastus intermedius m. (right; medial view; gracilis m. reflected infer-medially; sartorius m. reflected superio-medially; rectus femoris m. reflected superiorly)

Muscles of the Leg

Flexors

Gastrocnemius

This large muscle contains two heads with one originating from the medial condyle and one from the lateral condyle of the femur. Both medial and laterals heads insert into the calcaneal tendon (Figure 62). This muscle is functionally similar in humans and macaques.

Figure 62: Gastrocnemius m. (left; dorsal view)

Soleus

In humans and *Macaca*, this muscle lies deep to the gastrocnemius, arises from the head of the fibula and proximal tibia, and inserts onto the calcaneal tendon (Figure 63).

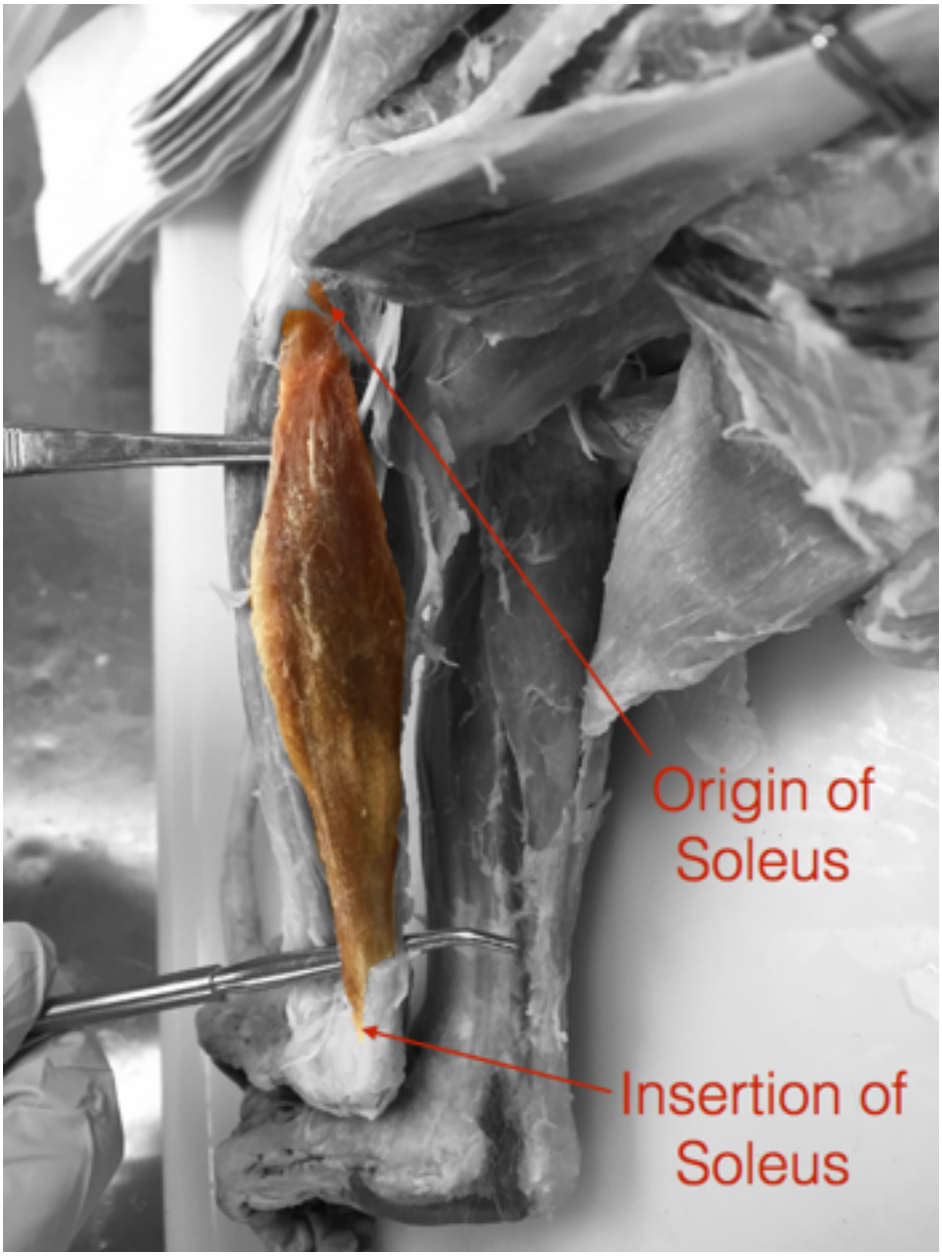

Figure 63: Soleus m. (left; dorsal view; gastrocnemius m. reflected superiorly)

Plantaris

This muscle is functionally similar in humans and macaques (i.e., plantar flexes the foot) however, the muscle is considerably more robust in *Macaca*. It originates just superior to the lateral epicondyle of the femur and inserts on the plantar fascia (Figure 64).

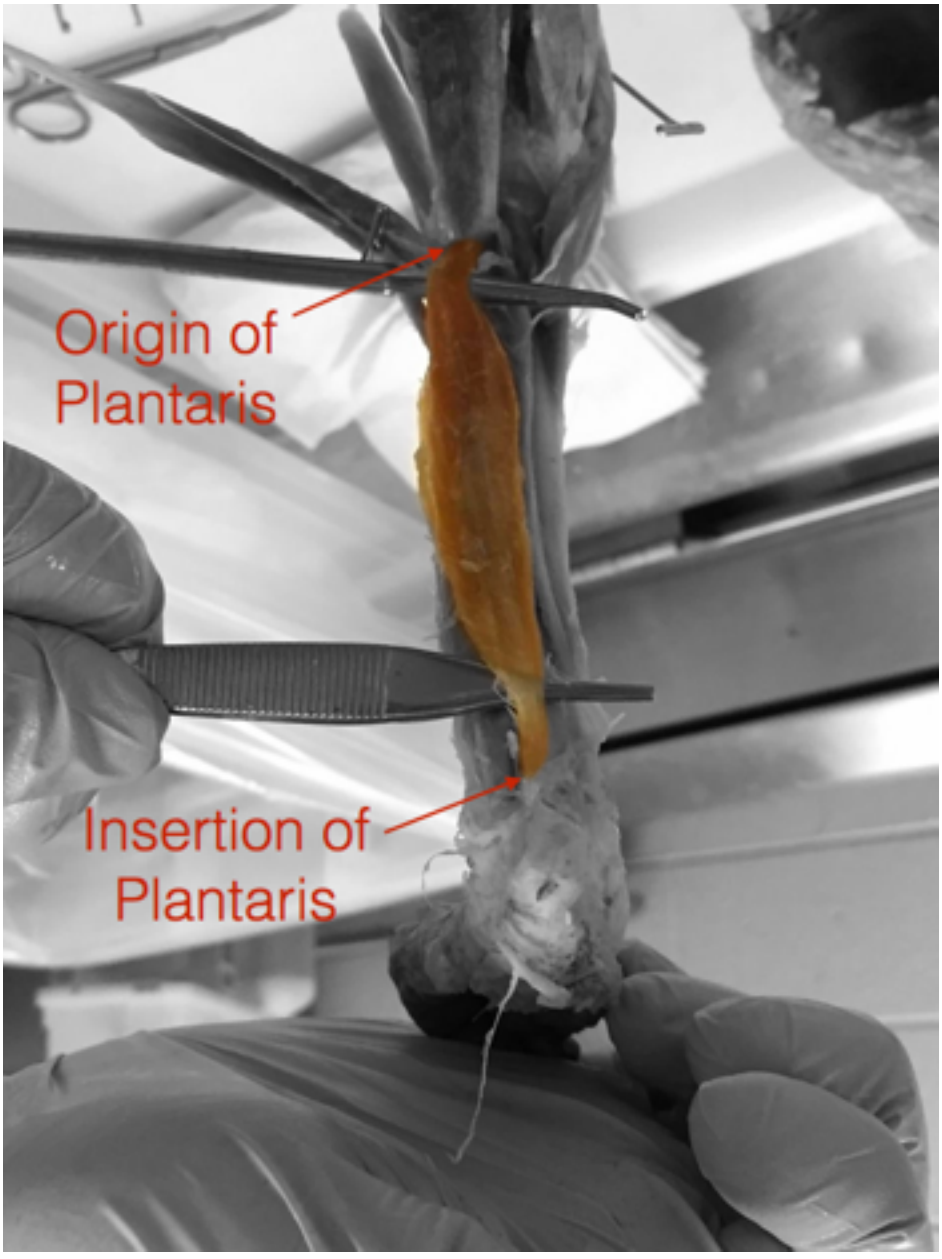

Figure 64: Plantaris m. (left; dorsal view; gastrocnemius m. reflected superiorly; soleus m. reflected superiorly)

Popliteus

Popliteus originates from the posterior aspect of the lateral epicondyle of the femur and inserts onto the proximal and medial aspects of the tibia (Figure 65). This muscle is similar in humans and macaques.

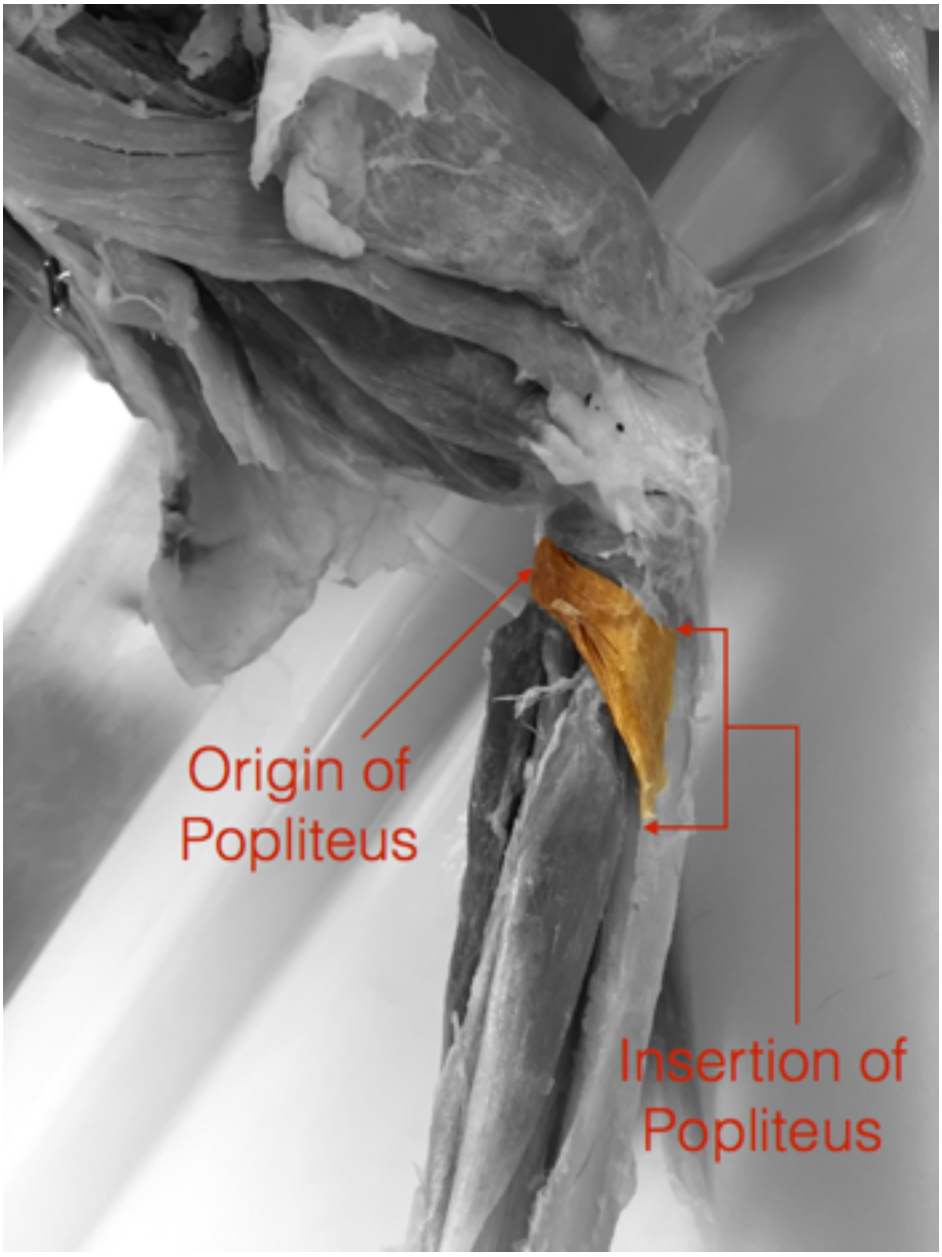

Figure 65: Popliteus m. (left; dorsal view)

Peroneotibialis

This muscle is typically absent in humans. In *Macaca*, it lies superior and partially beneath popliteus (Figure 66). It originates from the anterior portion of the fibular head and attaches to the proximal most portion of the posterior tibial shaft.

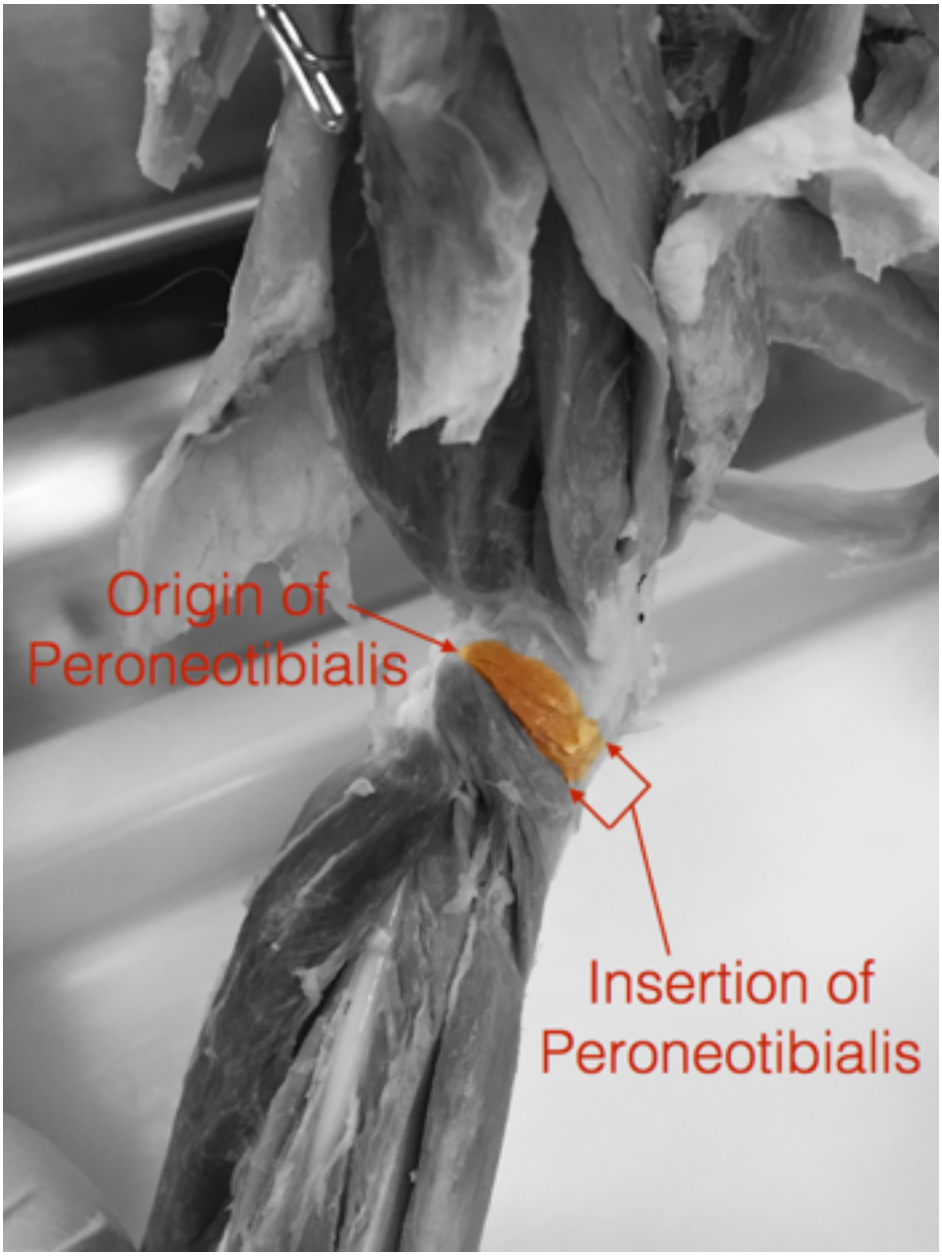

Figure 66: Peroneotibialis m. (left; dorso-medial view)

Flexor digitorum fibularis

This muscle is synonymous with flexor hallucis longus and functions similarly in humans and macaques. It originates from much of the posterior aspect of the fibular shaft and inserts onto the distal phalanx of the hallux (Figure 67). According to Howell and Straus (1933), this muscle also has attachments on the phalanges of digits 11I and IV although this was not dissected on our specimen.

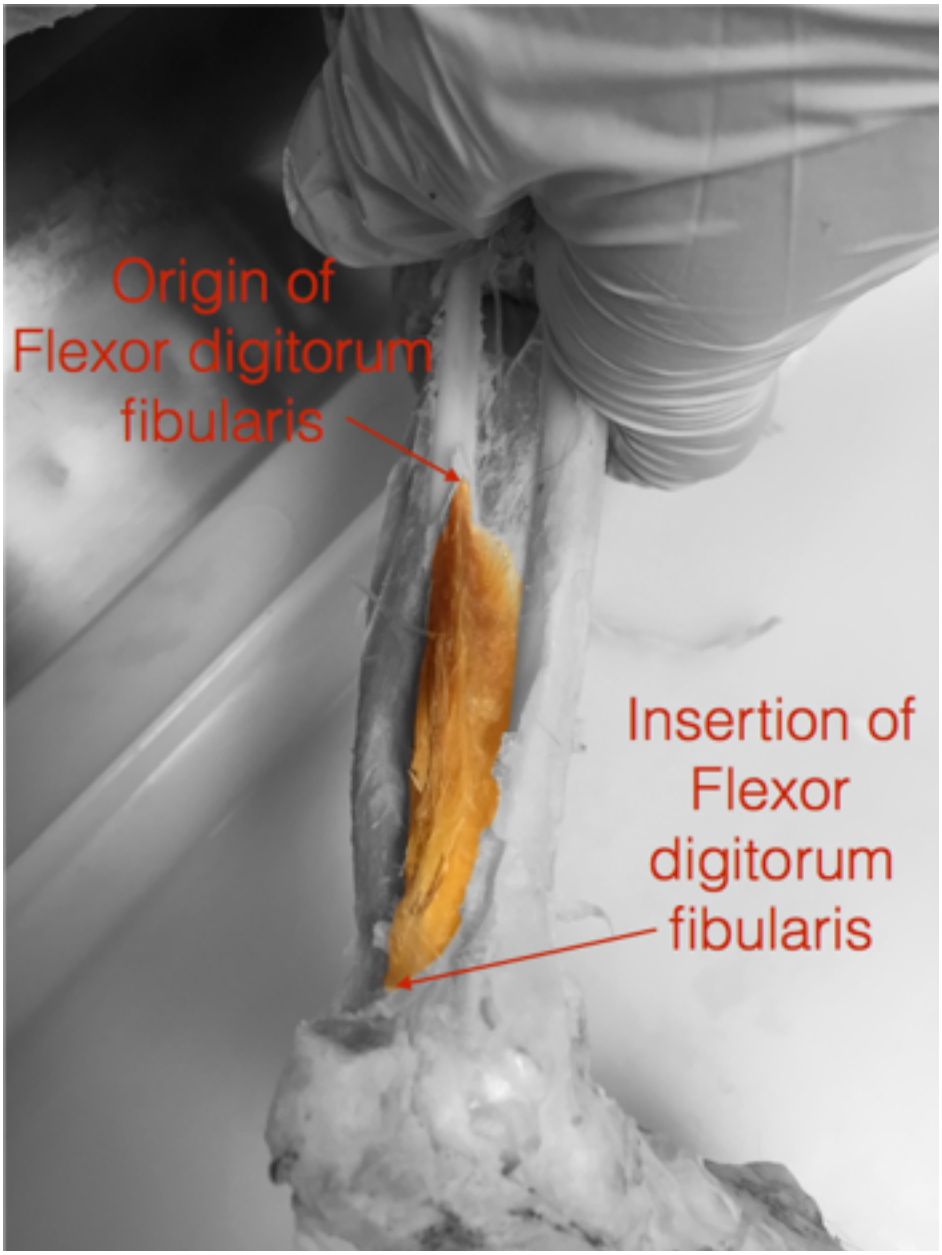

Figure 67: Flexor digitorum fibularis m. (left; dorsal view, muscle located on the medial aspect of the leg; gastrocnemius reflected superio-dorsally; soleus m. reflected superio-dorsally; planteris m. reflected superior-dorsally; flexor digitorum longus m. reflected superio-medially; tibialis posterior m. reflected superior-medially)

Flexor digitorum longus

This muscle is sometimes referred to as flexor digitorum tibialis. In humans and *Macaca*, flexor digitorum longus arises from the posterior portion of the tibial shaft (Figure 68). Unlike in humans where this muscle sends tendons to digits II-V, the Macaca flexor digitorum longus attaches to digits II and V only. Digits III and IV receive tendons of flexor digitorum fibularis.

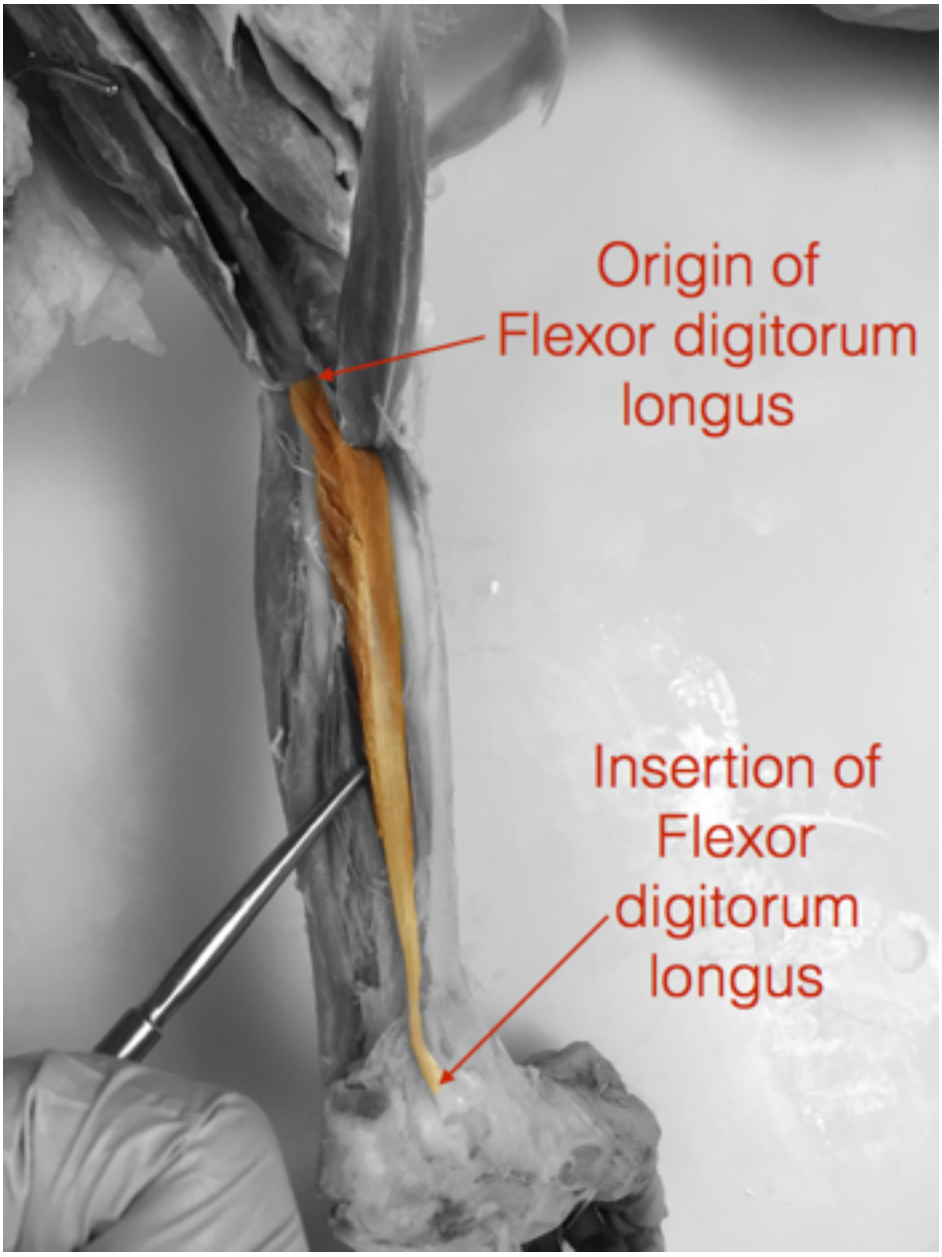

Figure 68: Flexor digitorum longus m. (left; medial view; tibialis posterior m. reflected superio-medially; gastrocnemius m. reflected superio-dorsally; soleus m. reflected superio-dorsally)

Tibialis posterior

This muscle originates from the posteromedially aspect of the tibia, interosseous membrane and medial fibula (Figure 69). It attaches to navicular and medial cuneiform and sometimes other tarsal bones (Howell and Straus, 1933). This configuration is similar in humans and *Macaca*.

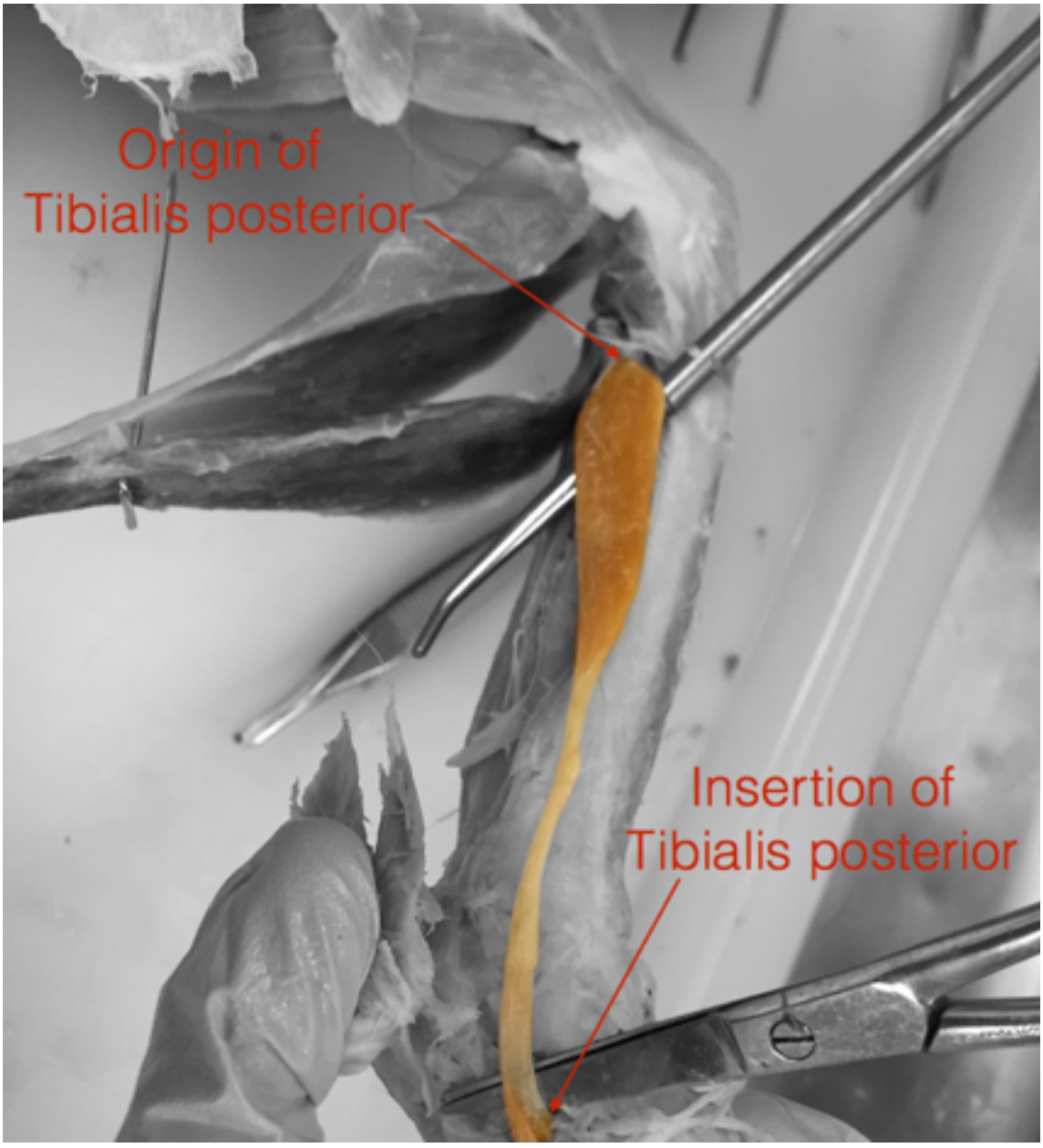

Figure 69: Tibialis posterior m. (left; medial view; gastrocnemius m. reflected superio-dorsally; soleus m. reflected superio-dorsally)

Extensors

Tibialis anterior

This muscles functions similarly in humans and macaques; however, in *Macaca* there are two distinct muscle bellies for tibialis anterior. Both the medial (Figure 70A) and lateral belly (Figure 70B) originate from the lateral condyle of the tibia and the lateral portion of the tibial shaft. The larger medial belly attaches to the first cuneiform bone and the lateral belly attaches to the first metatarsal.

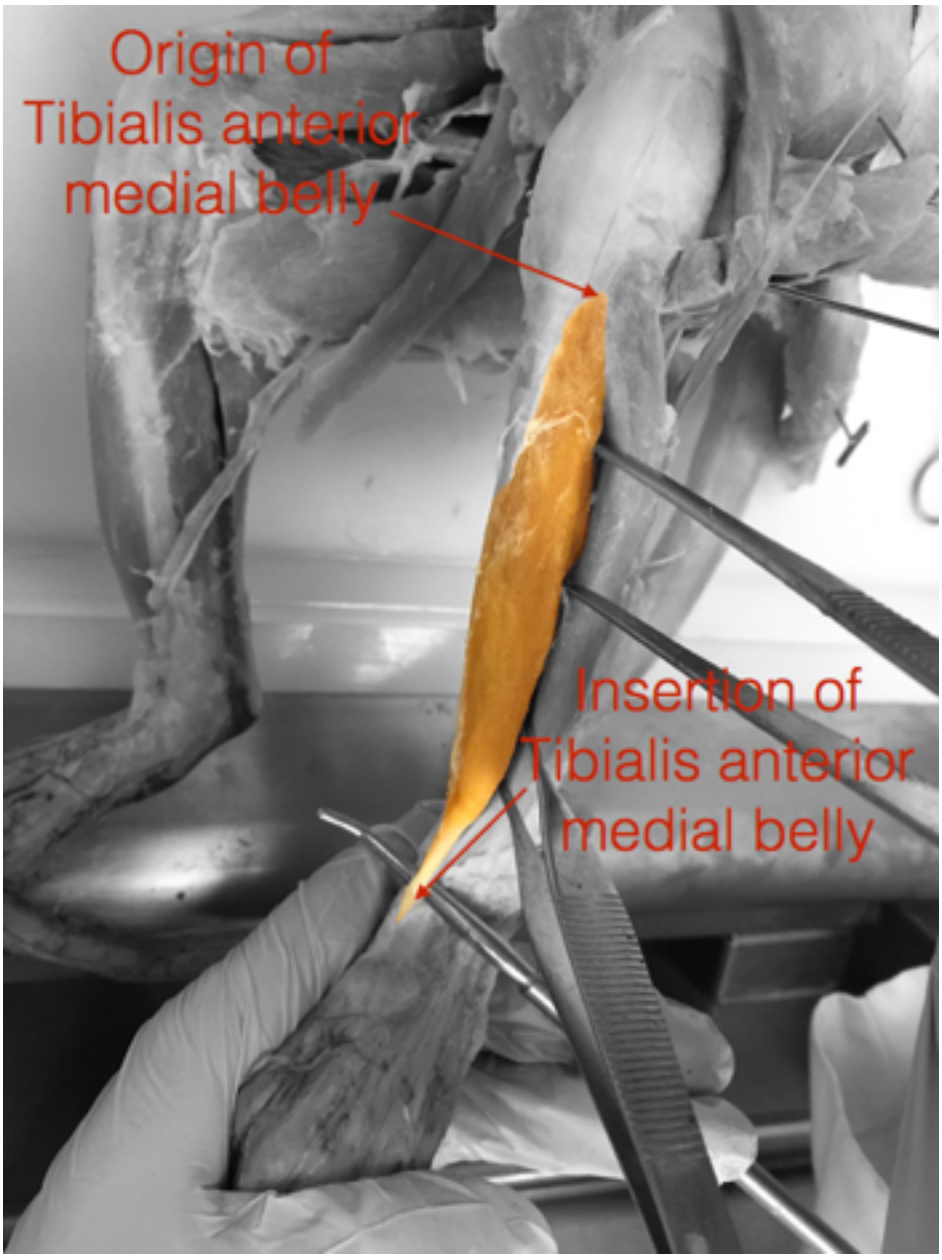

Figure 70A: Tibialis anterior m., medial belly (left; antero-lateral view)

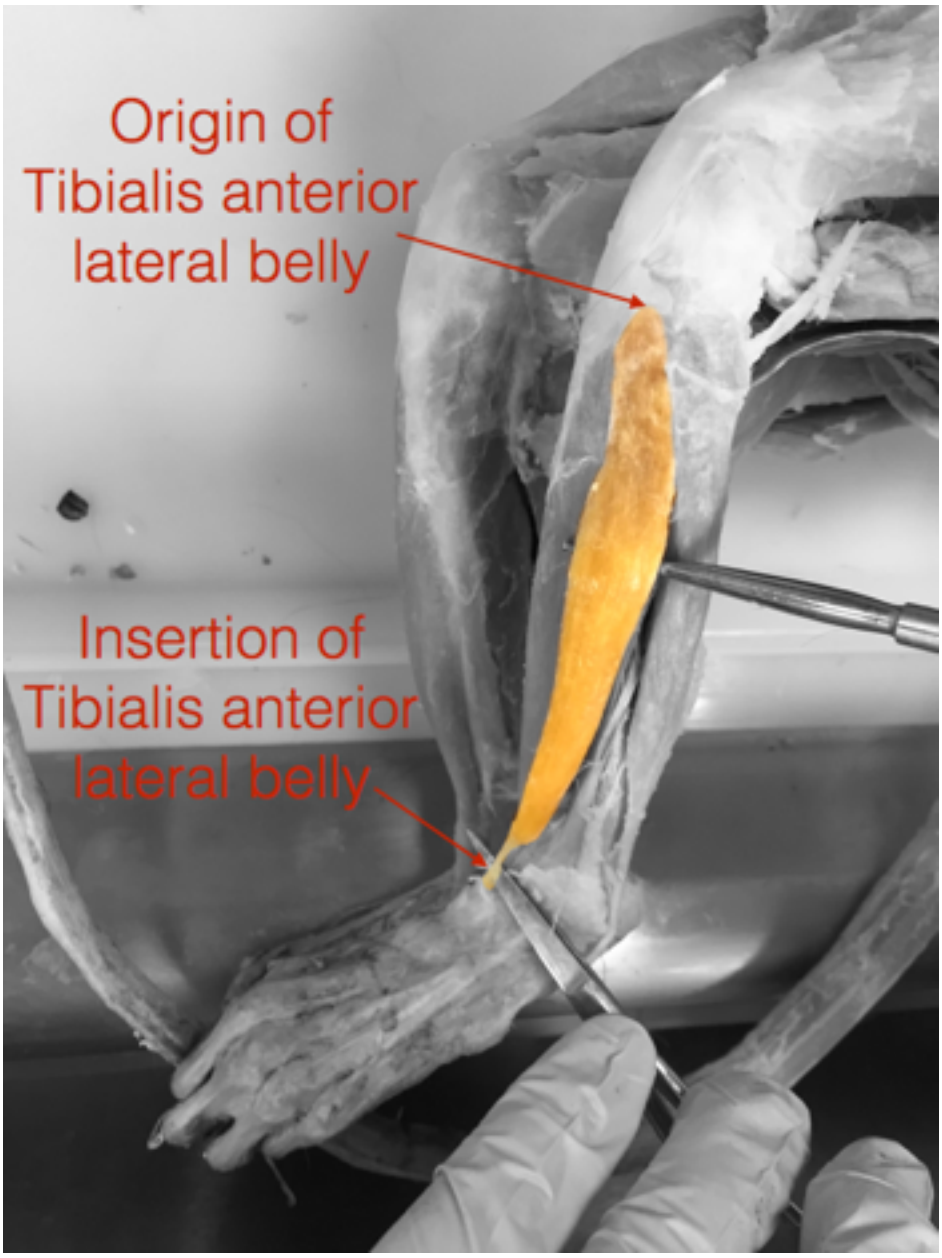

Figure 70B: Tibialis anterior m., lateral belly (left; lateral view)

Extensor hallucis longus

This muscle originates from the middle portion of the medial aspect of the fibula and interosseous membrane and attaches to both the proximal and distal phalanges of the hallux on the dorsal aspect (Figure 71).

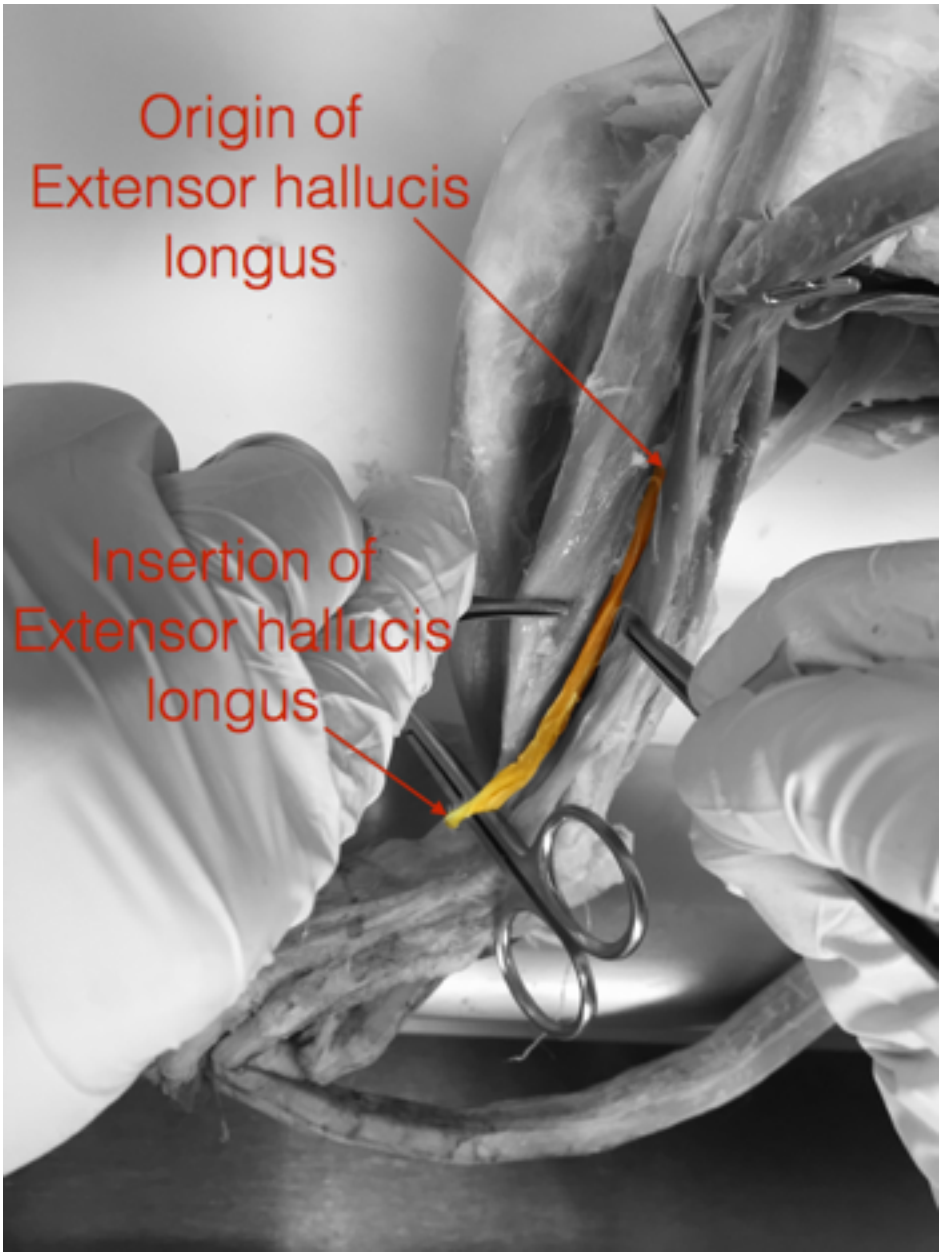

Figure 71: Extensor hallucis longus m. (left; lateral view; fibularis longus m. reflected superio-laterally; tibialis anterior m. reflected anteriorly; extensor digitorum longus m. reflected posteriorly)

Extensor digitorum longus

In humans and *Macaca*, this muscle arises from the fibular head, almost the entire anterior shaft of the fibula, and the interosseous membrane (Figure 72). It inserts on the middle and distal phalanges of digits II-IV.

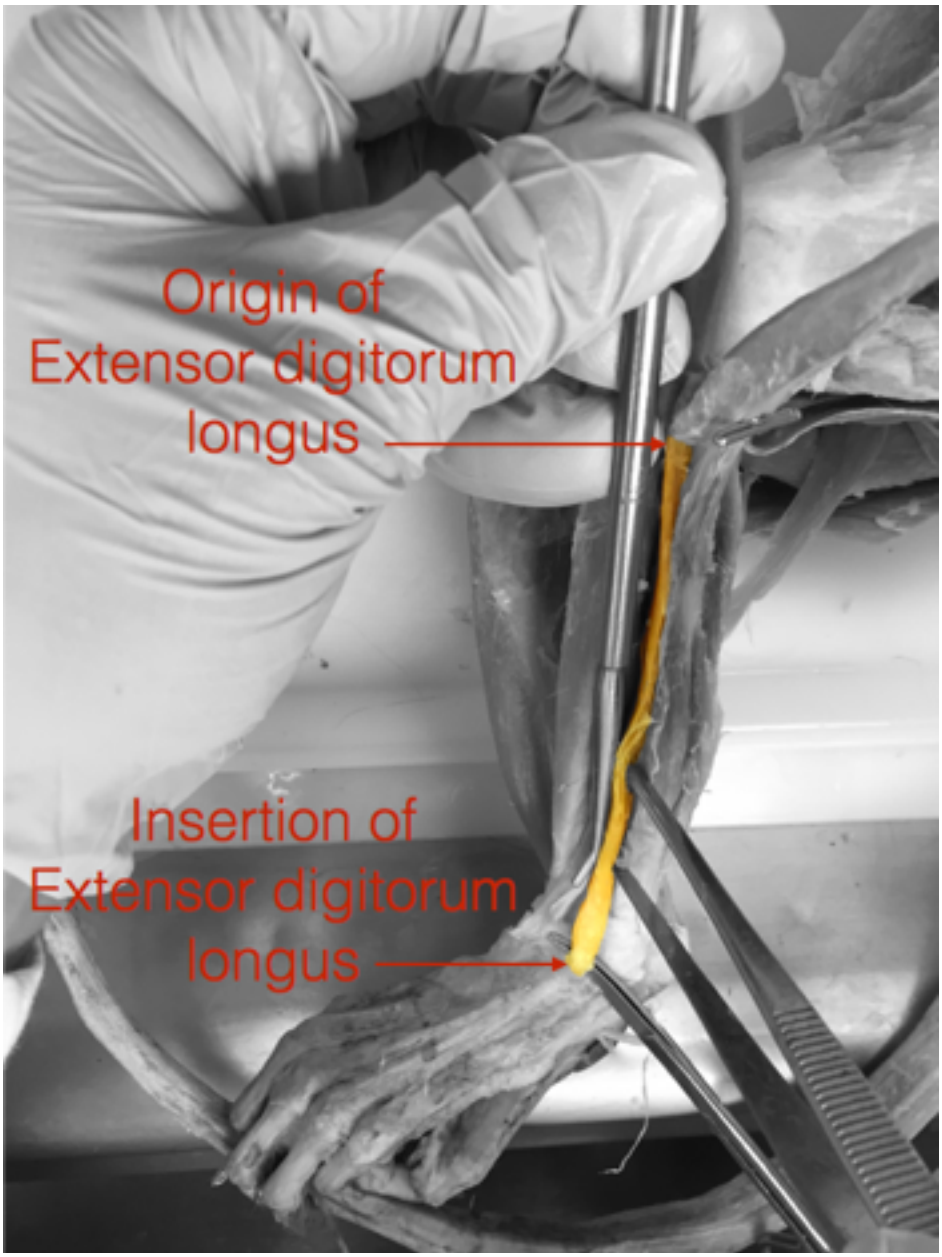

Figure 72: Extensor digitorum longus m. (left; lateral view; fibularis longus m. reflected superio-laterally; gastrocnemius m. reflected superio-dorsally)

Peroneus longus

Also known as fibularis longus, this muscle originates from the fibular head and proximal third of the shaft of the fibula (Figure 73). It inserts onto the base of the first metatarsal and sometimes attaches to the fifth metatarsal and or first cuneiform bone (Howell and Straus, 1933).

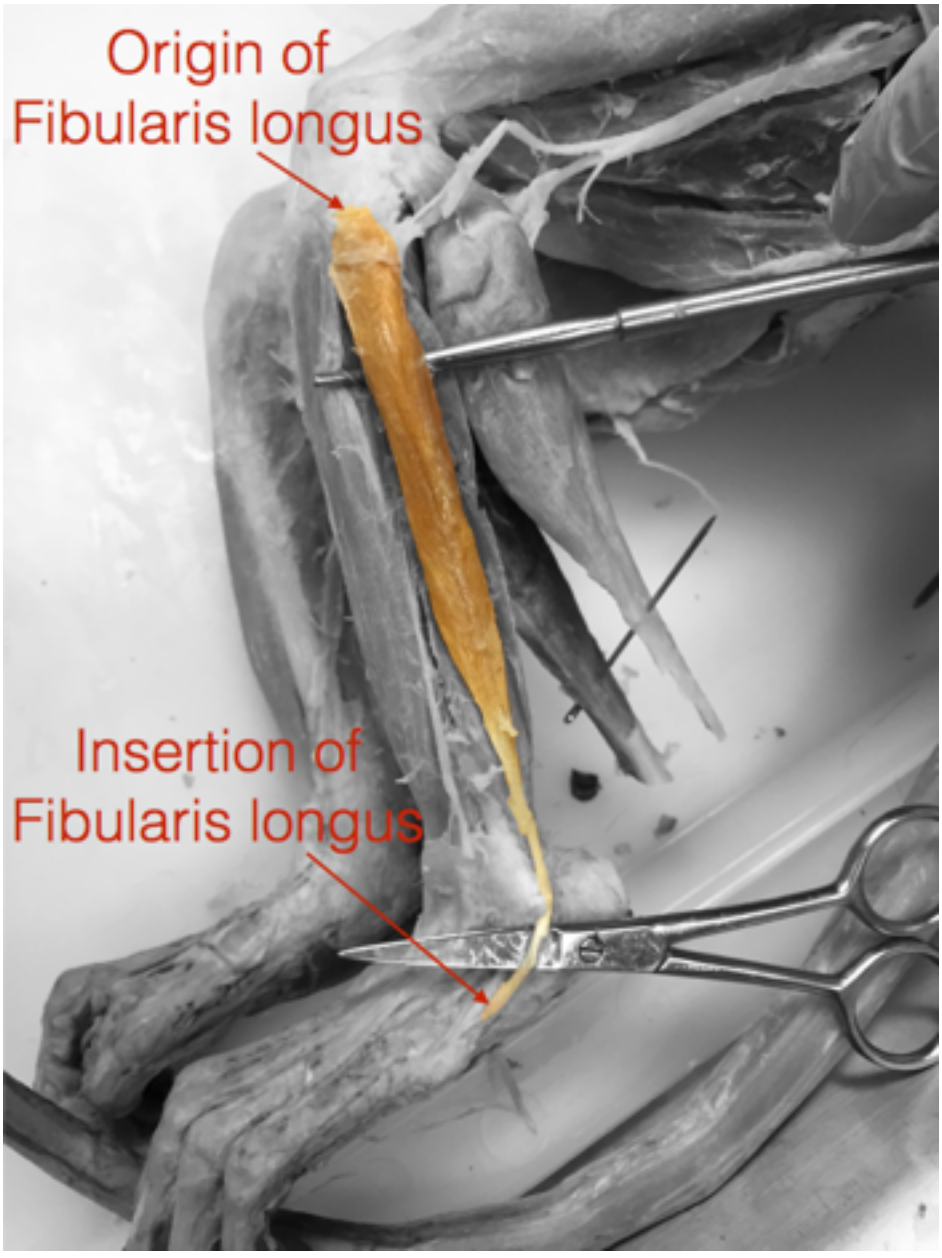

Figure 73: Fibularis longus m. (left; lateral view)

Fibularis brevis

This muscle is also called peroneus brevis. In humans and *Macaca*, this muscle originates on the distal half of the lateral shaft of the fibula and inserts onto the tuberosity of the fifth metatarsal (Figure 74). The peroneus tertii or fibularis tertii muscle is absent in *Macaca* (Howell and Straus, 1933).

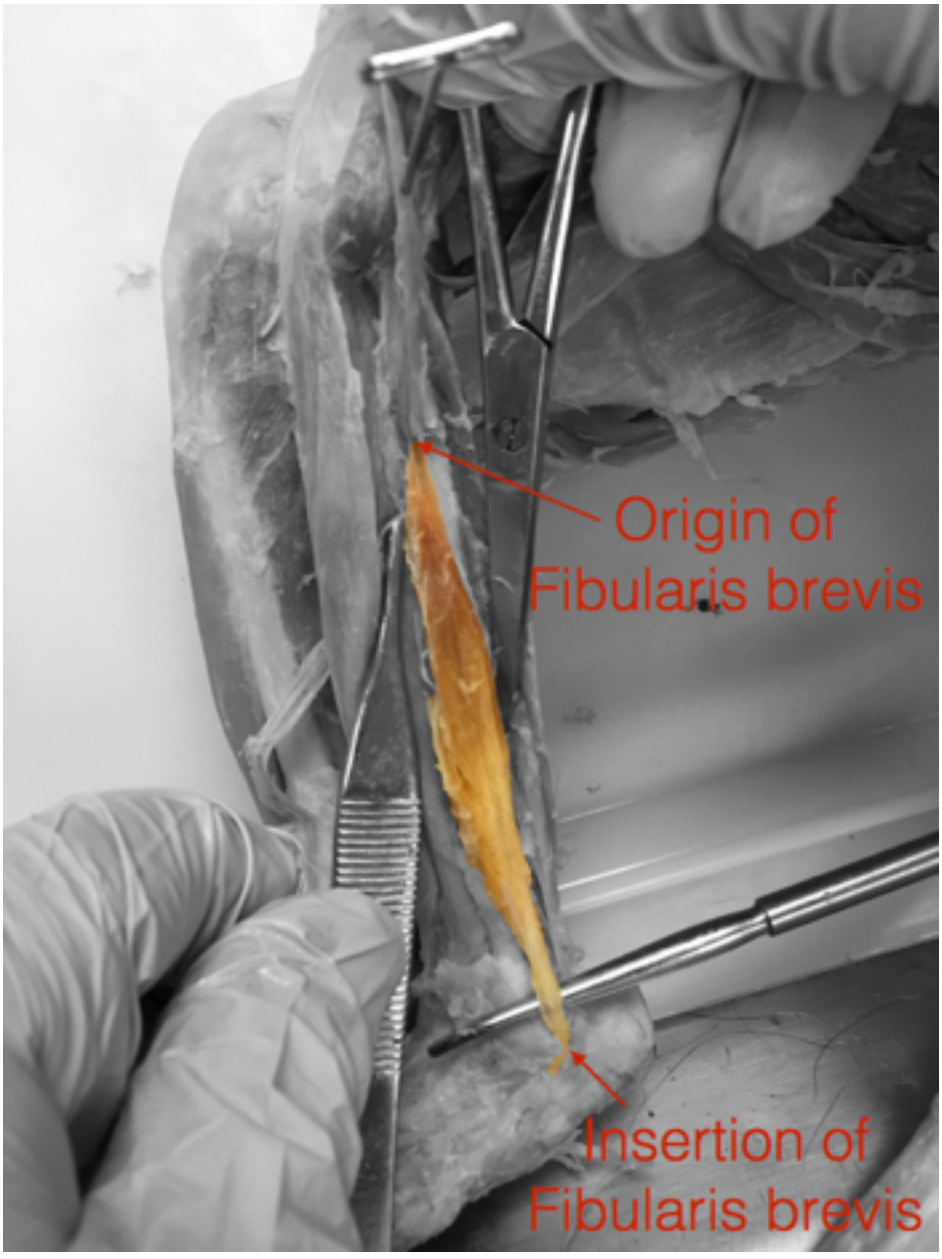

Figure 74: Fibularis brevis m. (left; lateral view; fibularis longs m. reflected superio-laterally; gastrocnemius m. reflected superio-dorsally; soleus m. reflected superio-dorsally)

Fibularis digiti quinti

This muscle is typically absent in humans but common in *Macaca* specimens. It arises from the posterolateral shaft of the fibula and attaches to the distal phalanx of digit V (Figure 75).

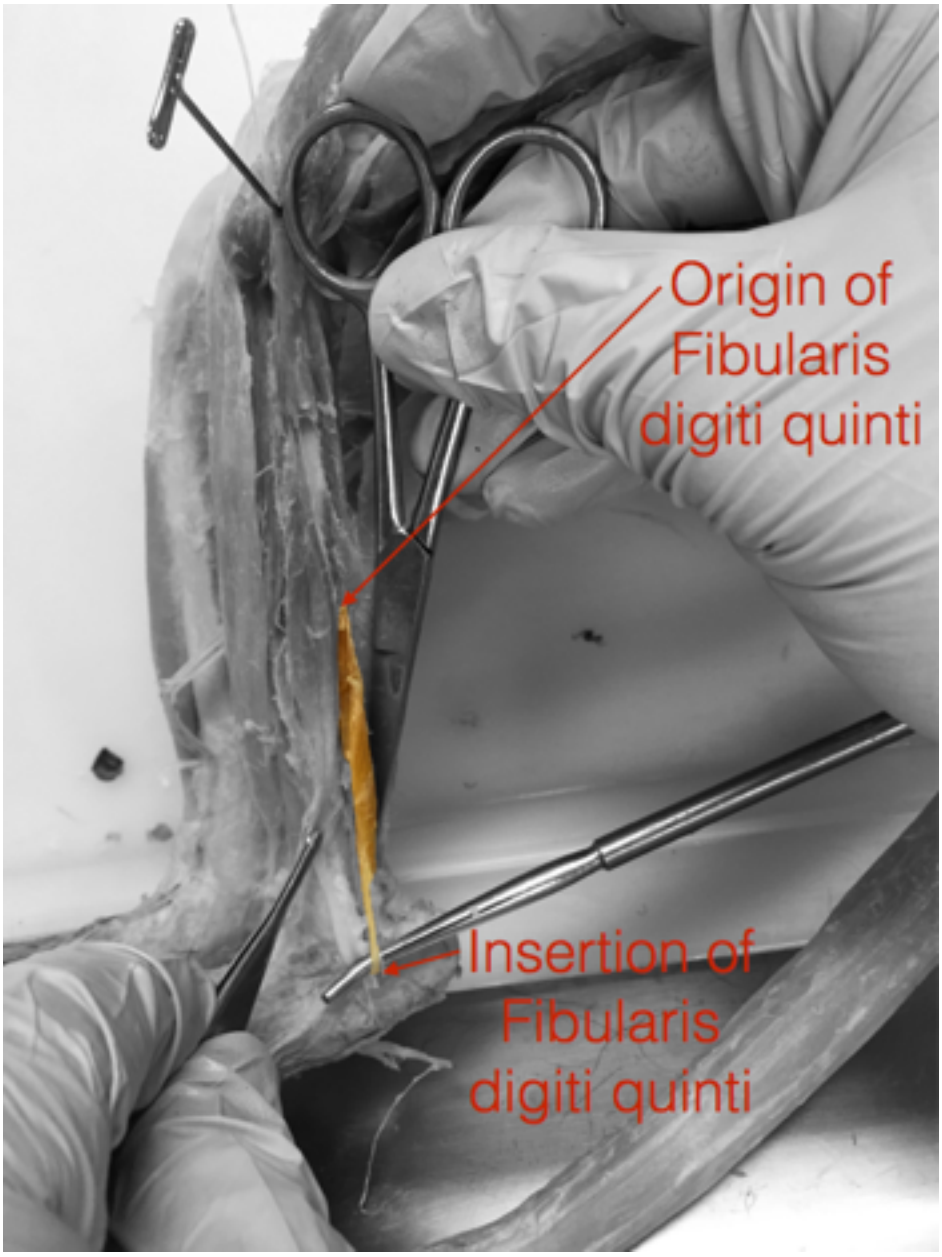

Figure 75: Fibularis digiti quinti m. (left; lateral view; extensor digitorum longus m. reflected anteriorly; gastrocnemius m. and soleus m. reflected superio-dorsally; plantaris m. reflected dorsally)

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